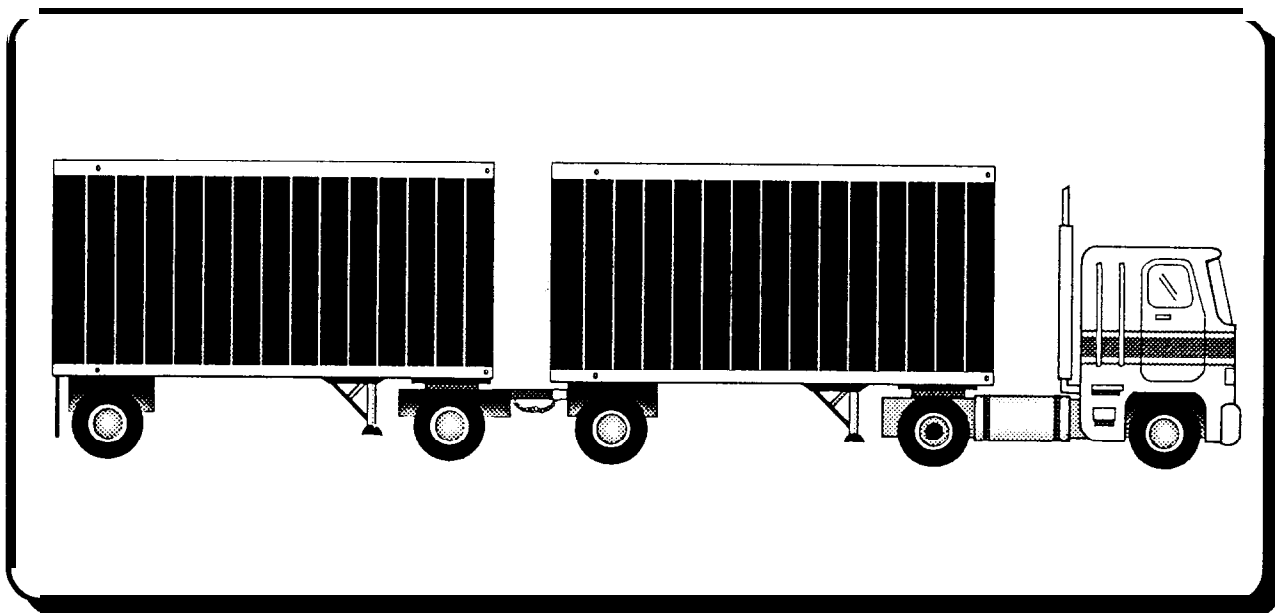


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TWIN-TRAILER DRIVER CURRICULUM

SUGGESTED UNITS OF INSTRUCTION
AND THEIR REQUIREMENTS

JHWA-97-2176-32



PROFESSIONAL TRUCK DRIVER INSTITUTE OF AMERICA
8788 ELK GROVE BOULEVARD, ELK GROVE, CALIFORNIA 95624
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176 pgs

AUGUST 1999

SUBJECT: *MC-92-10*
FBIWA

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Preface

This publication is made available in the interest of truck safety and the advancement of twin-trailer driver training. The content and procedures contained herein represent good practice against which a twin-trailer driver training course can be developed. The Federal Highway Administration of the U.S. Department of Transportation and its contractor, the Professional Truck Driver Institute of America, Inc. specifically disclaims any and all liability for its content or use.

The contents do not represent an official policy of any governmental agency. They have been developed under contract (DTFH61-91-C-00048) with the Department of Transportation, Federal Highway Administration.

FOREWORD

This document contains a unit outline curriculum for the training of drivers new to twin-trailer operation. The term "twin-trailer" refers to the combination of two trailing units with lengths up to 28-or 28.5 feet, often called "Western Doubles", as permitted by the Surface Transportation Assistance Act of 1982 (enacted January 1983).

The term "curriculum" refers to a prescribed course of study and to 1) what is to be taught, and 2) what it is to be taught with. However, the unit outline curriculum prescribed here includes only "what is to be taught." It assumes that "what is to be taught with" will be documented in other materials, including the following:

- **Trainina Manual** -- A manual containing materials needed by driver trainees for successful instruction.
- **Instructor Manual** -- A set of lesson plans providing detailed Instruction in administration of classroom, lab, range, and street lessons.
- **Test System** -- A set of written, range and street tests designed to assess attainment of the curriculum objectives.

It should be emphasized that this Twin-Trailer Driver Curriculum prescribes a course that is comprehensive in developing the basic or minimum competencies required to operate twin-trailer vehicles. Trainees successfully completing this basic course may still need additional road experience and specific company or job-related training.

How much additional learning experience is needed will obviously depend upon the individual trainee's capacity to learn; how much the basic curriculum must be expanded or enhanced to meet job needs; and the quality of instruction. Therefore, all organizations are urged to carefully evaluate the specific job requirements that their student drivers are being trained for and to add all necessary materials to this curriculum to enable the driver trainee to successfully meet those job requirements safely.

Developmental Process

The curriculum structure and its suggested content, as offered here, is the product of a developmental process which included among its sources of information, guidance, and expertise, the following:

- **Public Forum** -- Discussion at an assembly of over 70 persons representing trucking industry associations, motor carriers, insurance companies, government agencies, truck safety advocates, training institutions, experienced drivers of multiple trailer vehicles and other defined the need for, and content of, specialized training.
- **Steering Committee** -- A panel comprised of industry representatives, government officials, truck safety advocates, experts in the field of multiple trailer operations and others with strung interests in the safety and responsible operation of these vehicles provided project guidance as well as general technical support and assistance.
- **Technical Information Search** -- This activity identified the factors considered important to the safe and proper operation of twin-trailer trucks and the specialized training of the drivers who operated them. The primary purpose of this compilation was to identify the special characteristics, conditions, situational aspects of twin-trailer operation that have driver training implications and that are amenable to instructional treatment. The basic sources of information included technical reports, engineering analysis, research papers, accident summaries and analysis, trucking periodicals and safety publications. A technical panel of twin-trailer specialists was engaged to review the listing and to supply additional information unavailable from published sources*
- **Technical Advisory Panel** -- A panel of highly qualified professionals, experienced in both twin-trailer operation and driver training, provided project staff with the expert review and vehicle -specific expertise needed to meet project criteria. The panel reviewed and critiqued all technical content; provided specific technical assistance, pooled ideas on objectives, content and methods; served in a continuing capacity in reviewing curriculum content development during each phase of the

Acknowledgements

This curriculum document represents the cooperative efforts of many people on behalf of their organizations and through the leadership and guidance of the Professional Truck Driver Institute of America. Because of the significance of their efforts, special recognition is accorded to the members of the Technical Advisory Panel:

- **Mr. Leo Nellessen**, Consolidated Freightways, Salt Lake City, UT
- **Mr. Jake Reppert**, Yellow Freight System Inc., East Petersburg, PA
- **Mr. Richard Rohrer**, Global Safety Service Inc., Mechanicsburg, PA
- **Mr. Doyal Seale**, United Parcel Service, Portland, OR
- **Mr. Travis L. Walker**, Roadway Express System Inc., Nicoma Park, OK

Special recognition is due also, to the following individuals who performed most of the curriculum preparation and special technical tasks:

- **Mr. George L. Beaulieu**, SAFE Inc., Waco, TX
- **Mr. Robert M. Calvin**, Automotive Safety Foundation -- Highway Users Federation, Washington, D.C.

The PT DIA also wishes to recognize the significance of the technical and project advisory assistance provided by the Steering Committee. The following individuals and their organizations comprised the Steering Committee:

- **Mr. Louis Albert**, United Parcel Service, South Holland, IL
- **Mr. Steve Campbell**, American Trucking Assoc., Inc., Alexandria, VA
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- **Mr. John Sallak**, Oregon Trucking Assoc., Inc., Portland, OR
- **Mr. Dan Smith**, National Private Truck Council, Ontario, CA
- **Mr. Jim Turner**, ANR Freight Systems, Golden, CO
- **Mr. Mike Young**, South Dakota Dept. of Transportation, Pierre, SD

The PTDA gratefully acknowledges **Career Publishing Inc.**, Orange, CA for the assistance provided in the printing and publishing of this draft.

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Administrator's Guide

The Twin-Trailer Driver Curriculum is for driver trainees who already possess a CDL class A license or who have accumulated a minimum of six months of verifiable commercial driving experience. Therefore, the curriculum assumes a basic knowledge of commercial vehicle safe driving practices, and traditional driver training subjects. Of course, this does not preclude an organization from including these training subjects in their course of study.

Purpose

The curriculum prescribes a complete instructional program for training novice twin-trailer drivers. Its purpose is to aid schools and fleets in providing all the competencies required to operate a twin-trailer vehicle. The terms twin-trailers or "twins" as used in this document refer to combinations of two trailing units called "Western Doubles", as permitted by the Surface Transportation Assistance Act of 1982 (enacted January 1983).

Organization of Curriculum

The curriculum is divided into sections and units. An outline of the curriculum by section, unit, and instructional method appears on page 16. Five sections of instruction are used with each section containing from three to six units. Each section has different objectives.

CURRICULUM UNIT OUTLINE

UNIT Section I- Orientation

1.1	Twins In Trucking
1.2	Regulatory Factors
1.3	Driver Qualifications
1.4	Vehicle Configuration Factors

Section 2 - Basic Operation

2.1	Inspection
2.2	Coupling And Uncoupling
2.3	Basic Control And Handling
2.4	Basic Maneuvers
2.5	Turning, Steering & Tracking
2.6	Proficiency Development

Section 3 - Safe Operating Practices

3.1	Interacting With Traffic
3.2	Speed & Space Management
3.3	Night Operations
3.4	Extreme Driving Conditions
3.5	Proficiency Development

Section 4 - Advanced Operations

4.1	Hazard Perception
4.2	Hazardous Situations
4.3	Maintenance & Troubleshooting

Section 5 - Non-driving Activities

5.1	Routes And Trip Planning
5.2	Cargo & Weight Considerations
5.3	Public Relations And Safety

Sections Instructional Objectives

SECTION 1 - ORIENTATION

The units in this section provide an orientation to the training curriculum and covers the role twins play in the industry, the factors which affect their operations and the role the drivers play in the safe operation of twins.

SECTION 2 - Basic Operation

The units in this section cover the interaction between driver trainees and the vehicle. They are intended to teach driver trainees how to inspect, couple and uncouple twin trailers, ensure the vehicles are in the proper operating condition, and control the motion of twins under various road and traffic conditions.

SECTION 3 - Safe Operating Practices

The units in this section cover the interaction between driver trainees, the vehicle, and the traffic environment. They are intended to teach driver trainees how to apply their basic operating skills in a way that ensures their safety and that of other road users under various road, weather and traffic conditions.

SECTION 4 - Advanced Operations

The units in this section introduce higher level skills that can be acquired only after the more fundamental skills and knowledge taught in sections two and three have been mastered. The purpose of this section is to teach the perceptual skills necessary to recognize potential hazards and to demonstrate the procedures needed to handle a twin combination vehicle when faced with a hazard.

SECTION 5 - Non-Driving Activities

The units in this section cover activities not directly related to the vehicle itself but which must be performed by the twin trailer driver. the objective of the units in this section is to insure that these activities are performed in a way that assures safety to the driver, the vehicle, cargo, and other road users. Unit 5.3 provides instruction on the importance of professionalism, maintaining a good image, being in the public's eye, and how good safety principles help to maintaining good public and employer relations.

Instructional Sequence

The 21 units of instruction contained in the five sections may be taught in any sequence that leads to efficient learning. The first three sections form a natural learning sequence beginning with orientation to the vehicle and the industry (Section 1), then basic control of the vehicle's motion (Section 2), then the needs of the highway traffic environment (Section 3). The units in Sections 4 and 5 are more independent than the first three Sections and can generally be taught in any sequence. Because they involve classroom and laboratory instruction for the most part, they may be scheduled concurrently with behind-the-wheel (BTW) instruction to make the best use of equipment, facilities and training time.

Instructional Objectives

Objectives are specified for each unit of instruction. These objectives describe the performances, knowledge, skills, and attitudes that trainees must achieve before training can be considered adequate for certification.

- **Performance objectives** describe the "real world" performances that trainees are to achieve on the basis of training.
- **Knowledge objectives** describe the information that is needed to enable and/or motivate trainees to attain performance objectives.
- **Skill objectives** describe the perceptual, manipulative, and reasoning skills that must be attained through practice to achieve performance objectives.
- **Attitude objectives** describe the beliefs that trainees must hold in order to assure a high likelihood that performances will occur in actual twin-trailer operation.

Methods

The specifications identify five instructional methods:

- **Classroom:** Classroom instruction occurs indoors, accomplished by instructional aids that allow large numbers of trainees to be taught effectively at one time.
- **Independent study:** A portion of classroom instruction may be waived through the use of suitable independent study methods.
- **Lab:** Laboratory instruction refers to any instruction occurring outside of a classroom that does not involve actual operation of the vehicle or its components. It may take place in a parking lot, garage, or any other appropriate facility conducive to instruction.

- **Range:** Range instruction occurs on a protected off-street “driving range”, where trainees may make use of tractor-trailers without hazards from cars or other road users. Those institutions / companies that lack access to off-street facilities may conduct range instruction on public property, provided adequate control of other traffic is available to avoid danger to trainees, instructors, or other road users.
- **Street:** Street instruction refers to behind-the wheel (BTW) instruction that occurs in roadway configurations and traffic conditions needed to satisfy the objectives of the lessons for which the instruction is required.

Printed materials

Each program must provide the printed materials needed for effective instruction, including teacher’s guide and lesson plans, self-instructional text and manuals, classroom handouts, reference aids, and checklists. Design of materials must facilitate their effective use and should fulfill the following requirements:

- **Content:** Must be appropriate to intended use, e.g., self-instruction, preparation for instruction, and use during instruction. Information should be sufficiently comprehensive to achieve the announced objectives. The information should be up to date.
- **Format:** Must fit conditions of use -- that is in a classroom, on the range, in the vehicle, or independent study.
- **Organization:** The organization and presentation of instructional materials should be in accord with sound principles of learning. It should facilitate access to needed information, e.g., use of sequence, detailed indexing, and bibliographies.
- **Reading level:** The reading level of the instructional material should be keyed to the reading competence of the average trainee. Materials intended for trainee use should not exceed the sixth grade reading level.

Visual materials

Classroom instruction must be supported by appropriate visual materials including transparencies, slides/cassette presentations, films, video tapes, roll displays, traffic boards, models, mark-ups, etc. Visuals must fulfill the following requirements:

- **Content:** Must be relevant to the objectives of the unit in which the visual **was** used.
- **Presentation:** Must be highly informational as opposed to entertaining. It should be sufficiently comprehensive to achieve the announced instructional objectives.

- **Dynamic media (e.g., film, videotape):** Should be used whenever motion is an essential part of the information to be communicated.
- **Interaction:** Between instructor and trainee should be fostered by use of short presentations and visuals that can be created or altered during instruction (e.g., transparencies, superstats).

Equipment

Programs must provide all of the equipment needed for effective instruction. The following specifies the general equipment required throughout this curriculum. Additional equipment requirements are specified under individual unit requirements. The following standard items of training equipment are required:

- **Projectors:** To include motion picture, slide, overhead, and/or video tape. Visuals must be appropriate to the material being taught.
- **Range equipment:** Including traffic cones, stanchions, barriers, etc., to create maneuver restrictions in teaching basic control, docking, parking, and other basic maneuvers.
- **Maintenance equipment:** Including spare parts, tires, jumper cables, and various other tools necessary to properly maintain the equipment used in training.
- **Safety equipment:** To include fire extinguishers, first aid kits, reflective triangles, flashlights, and any other safety equipment appropriate to the instructional procedure.

Training vehicles

Several twin-trailer combinations are required to support the curriculum. The exact number of twin-trailers required is dependent upon the number of trainees in the school at one time, the proportion of their time spent in the vehicle and the trainee to vehicle ratios. The vehicles used for street training must meet all applicable state and federal requirements for operation on public roadways. This includes seat belt requirements. Specific operational equipment requirements are as follows:

- **Engine:** Diesel and / or gas powered.
- **Transmission:** At least two types of manual transmissions providing a range of from five to thirteen forward speeds.
- **Drive axles:** At least one twin screw tandem drive axle tractor.
- **Cab type:** Both conventional and cab over engine (COE).
- **Cab configuration:** When trainee observation is used, space must be provided for observers, e.g., a crew cab, replacement of the sleeper berth, or a cargo box.

- **Converter dolly:** The converter dolly used may have one or more axles and must be equipped with safety chains or cables to be secured to the vehicle pulling the dolly. There appears to be at least four types of dollies the most common of which is the single-drawbar "A-dolly". Therefore, the majority of the training should take place using the A-dolly. It is recommended that the trainee be provided some training on a double-drawbar, non-steering "B-dolly" also.
- **Occupant restraint systems:** As required by state laws, federal regulations, company policies, and the rules of common safety practice.
- **Trailers:** Special trailer types are required when specialized training is provided, such as tank trailers, car carriers, refrigerated trailers, or double bottoms. Standard training trailers should be van or box type twin-trailers with a minimum length of at least 27 feet. The overall length of the training and/or test vehicle (tractor-twin-trailer) should be in excess of 65 feet. During at least 50 percent of the street training, the twin-trailers should be loaded with a minimum of 15,000 pounds. An appropriate amount of the remaining street training time should occur with one trailer (rear) empty and both trailers empty to emphasize safety factors.

Certain equipment requirements can be waived when a driver trainee is being trained by or for a company whose operation doesn't require instruction on that piece of equipment.

Program operators may use special training devices to improve the effectiveness or economy of instruction. Hazard perception simulators, shifting simulators, cutaways, and models may be used in meeting minimum instructional requirements to the extent that they are appropriate to the unit curriculum criteria and capable of satisfying the instructional objectives of the unit.

Facilities

Facilities required in support of the classroom, lab, range and street instruction must meet the currently acceptable minimum state standards for space per trainee, lighting, ventilation and other standards as required by the State Offices of Fire, Health, and OSHA.

- **Classroom facilities:** They must provide space, furniture, lighting, heating, and ventilation needed for a good learning environment.
- **Lab facilities:** Like the classroom facilities, they must provide space, furnishings, lighting, heating, and ventilation appropriate to the environment and capable of providing a good learning environment.

- Range **facilities:** They must be obstruction free and sufficiently surfaced to permit maneuvers to be performed, by a novice driver, without loss of vehicle control. The dimensions must be large enough to permit the number of vehicles involved in instruction to carry out the maneuvers needed for obtainment of instructional objectives without causing interference or danger to other vehicles on the range. Access to the range area must be limited in order to avoid creating a hazard to or from the general public.
- Street routes: They must represent the broadest range of traffic situations with respect to the following:
 - Number of lanes -- two lanes, multi-lanes
 - Setting -- urban, suburban, rural
 - Configuration-- straight, curved, ramps, merges, etc.
 - Grade -- steep, gradual, uphill, downhill
 - Structures -- bridges, tunnels, road crossings, railroad crossings
 - Road density -- light tunnels, road crossings
 - Access -- unlimited, limited, or freeway

Hours of Instruction

An outline of the curriculum by section, unit, and instructional method appears on the following page. The numbers indicate the minimum hours required for each unit, and each instructional method within that unit. Range and street hours refer to BTW instruction. Exceptions to these minimum hours are acceptable where:

- Attainment of instructional objectives for each unit can be demonstrated through objective measures.
- Trainees have already achieved partial fulfillment of objectives through prior training or experience.
- Trainees are being trained by or for specific employers whose operation makes attainment of certain objectives unnecessary.

As shown in the outline, a minimum of 7 15 hours of direct driver trainee participation is deemed necessary for a driver, inexperienced in twins, to attain the curriculum's instructional objectives. The standards require that each trainee must receive at least 56 hours of driving time during BTW instruction.

All training hours are measured as clock hours (60 minutes) rather than class period hours (e.g. 45 or 50 minutes, etc.). In order to fulfill the requirements within the minimum hours indicated, all in-vehicle BTW time must be measured by the clock hours of actual driving time accumulated by the driver trainee. Observation time is *not* counted as BTW driving time.

SUGGESTED CLOCK HOURS OF INSTRUCTION

UNIT	Section 1- Orientation	CLASS-ROOM	LAB	RANGE	STREET	TOTAL
1.1	Twins In Trucking	1.5				1.5
1.2	Regulatory Factors	1.5				1.5
1.3	Driver Qualifications	1				1
1.4	Vehicle Configuration Factors	3				3
TOTAL		7	0	0	0	7

Section 2 - Basic Operation

2.1	Inspection	2	4			6
2.2	Coupling And Uncoupling	2		3		5
2.3	Basic Control And Handline	0.75		2		2.75
2.4	Basic Maneuvers	0.75		4		4.75
2.5	Turning, Steering & Tracking	1		2		3
2.6	Proficiency Development	0.5		5	8	13.5
TOTAL		7	4	16	8	35

Section 3 - Safe Operating Practices

3.1	Interacting With Traffic	2			2	4
3.2	Speed & Space Management	2	2		2	6
3.3	Night Operations	1.25	1		2	4.25
3.4	Extreme Driving Conditions	2	2			4
3.5	Proficiency Development	0.75			24	24.75
TOTAL		8	5	0	30	43

Section 4 - Advanced Operations

4.1	Hazard Perception	4			2	6
4.2	Hazardous Situations	3				3
4.3	Maintenance & Troubleshooting	4	4			8
TOTAL		11	4	0	2	17

Section 5 - Non-driving Activities

5.1	Routes And Trip Planning	4.5				4.5
5.2	Cargo & Weight Considerations	4.5	2			6.5
5.3	Public Relations And Safety	2				2
TOTAL		11	2	0	0	13
CURRICULUM TOTALS		44	15	16	40	115

Units of Instruction

Overview

There are 21 instructional units in the Twin-Trailer Driver Curriculum. These units are grouped into five sections:

- Section 1 - Orientation
- Section 2 - Basic Operation
- Section 3 - Safe Operating Practices
- Section 4 - Advanced Operation
- Section 5 - Non-driving Activities

Each of the unit descriptions is organized to present this definitive information about each unit of instruction:

- **Purpose:** A short statement of unit purpose and intent. Some unit purpose statements may be reinforced with a declaration of emphasis or a statement of justification.
- **Outline of content:** A list of the suggested major subject areas covered by the unit of instruction.
- **Instructional objectives:**
 - Performance objectives
 - Knowledge objectives
 - Skill objectives
 - Attitude objectives
- **Major supporting concepts:** A summary listing of the general ideas or conceptual foundation upon which instruction is to be based, emphasized, justified, structured or focused.
- **Materials:** Descriptive or illustrative information useful to provide instructional support and definition.

Subject matter outline is as follows:

OUTLINE OF SUBJECT MATTER

Section 1 - Orientation

Unit 1.1 Twins In Trucking

1. introduction
2. Professional driver
3. Background of twins in transportation

Unit 1.2 Regulatory Factors

1. Federal government
2. State and local government
3. Specific regulatory factors affecting twins

Unit 1.3 Driver Qualifications

1. Federal government
2. State and local government
3. Personal health and driving
4. Driver training and professionalism

Unit 1.4 Vehicle Configuration Factors

1. Introduction
2. Tractor cab design
3. Tractor axle configuration
4. Basic full or semi trailer types with or without pintle hook
5. Trailer axle configuration
6. Converter dolly
7. Vehicle configurations
8. Articulation factors
9. Axle arrangement factors
10. Matched equipment factors
11. Trailer placement rules, regulations and policies

Section 2 - Basic Operation

Unit 2.1 Inspection

1. Introduction to vehicle inspections
2. Pre-trip inspection procedures
3. Enroute inspection procedures
4. Post-trip inspection procedures
5. Additional procedures for reporting
6. What to look for when inspecting tractor, trailer and converter dolly
7. Vehicle walk around sequence

Unit 2.2 Coupling and Uncoupling

1. Introduction to hitching mechanisms
2. Combination vehicle air brakes
3. Coupling routine includes
4. Detailed step by step coupling procedures
5. Detailed step by step uncoupling procedures
6. Load sequencing and trailer placement
7. Summary of safety concerns

Unit 2.3 Basic Control and Handling

1. Putting the vehicle in motion
2. Stopping the vehicle
3. Braking performance is a function of
stopping distance and vehicle controllability
4. Handling characteristics
5. Handling and stability characteristics
6. Summary of safety concerns

Unit 2.4 Basic Maneuvers

1. Backing
2. Parking twins
3. Lane positioning and path selection
4. Merging
5. Summary of safety concerns

Unit 2.5 Turning, Steering and Tracking

1. Turning the vehicle
2. Turns
3. Steering
4. Trailer fidelity (tracking)
5. Off-tracking
6. Summary of safety concerns

Unit 2.6 Proficiency Development: Basic Operations

1. Introduction to proficiency development exercises (Classroom)
2. Proficiency development: Basic control (Range)
3. Proficiency development: Basic maneuvers (Pre-street)

Section 3 - Safe Operating Practices

Unit 3.1 Interacting With Traffic

1. Introduction to sharing the road with other traffic
2. Visual search techniques
3. Communications

Unit 3.2 Speed and Space Management

1. Speed management
2. Space management

Unit 3.3 Night Operations

1. Night driving factors
2. Night driving procedures

Unit 3.4 Extreme Driving Conditions

1. Cold weather operations
2. Hot weather, desert conditions
3. Mountain driving

Unit 3.5 Proficiency Development: Safe Operating Practices

1. Introduction to on-street proficiency development (Classroom)
2. Proficiency development: Safe Operating Practices

Section 4 - Advanced Operations

Unit 4.1 Hazard Perception

1. Importance of hazard recognition
2. Road characteristics
3. Road user characteristics
4. Road user activities
5. Characteristics of twins
6. Commentary driving techniques

Unit 4.2 Hazardous Situations

1. Hazardous situations
2. Emergency maneuvers
3. Skid dynamics
4. Types of skids twins can experience
5. Skid recovery
6. Rollover
7. Unsafe driving acts

Unit 4.3 Maintenance and Troubleshooting

1. Nature and importance of preventive maintenance
2. Performing basic servicing and routine maintenance
3. Diagnosing and reporting vehicle trouble

Section 5 - Non-Driving Activities

Unit 5.1 Routes and Trip Planning

1. Trip planning principles
2. Route planning principles
3. Hazardous materials
4. Record keeping and trip records
5. Communications

Unit 5.2 Cargo and Weight Considerations

1. Cargo documentation
2. Loading, securing and unloading
3. Weight distribution and center of gravity
4. Load sequencing and trailer placement

Unit 5.3 Public Relations and Safety

1. The image of the trucking industry
2. Contact with the public
3. Customer relations
4. Employer relations
5. Safety concerns

SECTION 1 - ORIENTATION

The units in this section provide an orientation to the training curriculum and covers the role twins play in the industry, the factors which affect their operations and the role the drivers play in the safe operation of twins.

Four units comprise this section:

UNIT: SUGGESTED CLOCK HOURS OF INSTRUCTION

UNIT	CLASS- ROOM	LAB	RANGE	STREET	TOTAL
1.1	Twins In Trucking	1.5			1.5
1.2	Regulatory Factors	1.5			1.5
1.3	Driver Qualifications	1			1
1.4	Vehicle Configuration Factors	3			3
TOTAL	7	0	0	0	7

1.1 TWINS IN TRUCKING

Purpose

This unit provides an introduction to the emergence of twins in trucking and serves as an orientation to the course content. Emphasis is placed on the role the driver plays in transportation.

Outline of Suggested Content

☐ **Introduction**

- A. Rules of conduct and safety.
- B. Course schedule and instructional unit outline.
- C. Course objectives and methods of evaluation.
- D. Requirements for completion of course.

CI Professional driver

- A. Follow the law.
- B. Maintain a professional appearance.
- C. Maintaining a positive attitude.
- D. Conduct on and off duty.
- E. Following company rules and regulations.
- F. Federal Motor Carrier Safety Requirements.
- G. Basic job requirements.

CI Background of twins in transportation

- A. Importance of twins to transportation.
- B. Impact on the industry.
- C. Safety record of twins.
 - 1. Industry wide.
 - 2. Company wide.
- D. Public's perspective of twins.
- E. Federal, state and local government perspective.
- F. Trucking company and drivers perspective. .

INSTRUCTIONAL OBJECTIVES

KNOWLEDGE OBJECTIVES

Driver must know:

- Course objectives and expectations.
- Rules of conduct and safety while in training.
- Methods of evaluating performance and standards to be met.
- Minimum requirements for completion of course.
- Company rules and regulations.
- Basic job and FMCSR requirements.
- General operation of trucks in trucking.
- The impact the driver has on the image of his company and the trucking industry.

ATTITUDE OBJECTIVES

The driver must believe:

- That obeying traffic laws will not only reduce the risks of having an accident but will enhance the image of the professional driver.
- That company rules and government regulations are important and should be followed.
- That it is his responsibility to enhance the image of the professional driver on the road and elsewhere*
- That the perception of how others see professional drivers handling themselves and their vehicles is very important.
- That a professional driver has a moral obligation to himself and the motoring public to be the best he / she can be.

Major supporting concepts

- Motor carriers and drivers ultimately must be the ones who decide that professional driving behavior is the only acceptable way to operate heavy trucks. This can be accomplished, on the part of motor carriers, by continuous efforts to qualify, hire, and train only the best, most professional people to operate their trucks. This must be coupled with consistent driver supervision and reasonable trip scheduling. For drivers, it involves adherence to the principles of professionalism, good judgement, common sense and courtesy.

- Professionalism is expressed as an attitude that marks the difference between the true professional driver and a would be pretender.
- Professionalism is the practice of safe, courteous and responsible behavior, at all times, on and off the highway.
- Every driver, professional or not, is an ambassador carrying a message to the public about truck safety and driving professionalism.
- Ultimately, the attitude and behavior of driving professionals will determine the public's perception of truck safety and truck drivers.
- Public awareness of truck safety and media attention to the topic are intense. Many people perceive current truck safety problems as the consequence of trends toward more and larger trucks.
- Compared with the most commonly used combination trucks, twins offer the advantages of increased volume capacity.
- Twins are particularly well suited to LTL operations. They provide increased volume capacity and reduced freight handling costs.
- Twins allow greater flexibility in handling and routing LTL cargo. They offer an opportunity to bypass some of the terminal handling steps. In many instances, the pickup and delivery of freight can be accomplished with the same trailer.
- In addition to the advantage of added "cube capacity", use of twins permits truck operators to deliver more shipments of less than a full truck load directly to their consignees without handling the shipment.
- Twins provide greater flexibility in dispatching; one short trailer operated as a single is easier to maneuver in congested urban areas for pickup and delivery.
- Because the twin trailers must be uncoupled and loaded and unloaded separately, they require additional loading stations and freight handlers. They are used most efficiently in the twin trailer configuration and are too inflexible for most truck load (TL) operations.
- Twins offer the industry a vehicle with high cargo volume that retains the practical benefit of good low-speed maneuverability.

MATERIALS

Classroom instruction must be supported by material describing course requirements, instructional objectives, schedules, rules and regulations. Instructional material, transparencies, wall charts, or individual class handouts necessary to complete the course should also be included.

1.2REGULATORY FACTORS

Purpose

This unit provides instruction on the federal, state and local governmental bodies who propose, enact, and implement the laws, rules, and regulations which affect the trucking industry. Emphasis is placed on those regulatory factors which affect twins.

Outline of Suggested Content

☐ Federal government

A. Interstate Commerce Commission (ICC)

1. Oversees freight rates.
2. Issues operating permits.
3. Regulates non-exempt, for-hire interstate carriers.

B. U.S. Department of Transportation (USDOT)

1. Federal Highway Administration (FHWA).
 - a. Federal Motor Carrier Safety Regulations (FMCSR).
 - b. Hazardous Materials Regulations (HMR).
2. Office of Motor Carrier Safety (OMCS).

C. Department of Defense

1. Military Traffic Management Service.

D. Environmental Protection Agency (EPA)

1. Hazardous Materials Regulations.

E. Nuclear Regulatory Commission (NRC)

1. Hazardous Materials Regulations.

F. Occupational Safety and Health Administration

1. Hazardous Materials Regulations.

G. National Transportation Safety Board (NTSB)

1. Investigates transportation accidents and recommends corrective measures,

H. Office of Technology Assessment.

1. Provides the Congress with studies.
2. Recommends legislation, further studies, corrective measures..

CI State and local governments

- A. States regulate motor carriers.
- B. States set vehicle laws.
 - 1. Length, width and weight limits.
 - 2. Issue licenses to drivers.
- C. Usually a state public utility regulates intrastate trucking.
 - 1. Collects road, fuel and use taxes.
 - 2. Issue operating permits.
 - 3. Usually responsible for port of entries and “scale houses”.
- D. Local governments may set vehicle laws.
 - 1. Length, width and weight limits on specific roads.

□ Specific regulatory factors affecting twins

- A. Surface Transportation Assistance Act (STAA) of 1982
 - 1. Congress requires states to allow:
 - a. Twins (28 ft. trailer) on interstate & other principle roads.
 - b. Reasonable access by twins from the interstate & etc. to:
 - Terminals and facilities for food, fuel, repairs.
 - Points of loading & unloading for certain goods carriers.
 - FHWA issues final rule on 6/1/90 defining “reasonable access”.
 - c. Vehicles up to 102 inches wide on interstate & other principle roads.
 - d. Single axle weight of 20,000 pounds.
 - e. Tandem axle weight of 34,000 pounds.
 - f. Gross vehicle weight of 80,000 pounds.
- B. Tandem Truck Safety Act (TTSA) of 1984 .
 - 1. Amended the STAA to permit:
 - a. Twins up to 28.5 ft. long and 102 in. wide access to points of loading and unloading as household goods carriers.
- C. States and turnpike (toll road) authorities.
 - 1. Special rules and regulations governing twins.
 - 2. Special requirements for vehicle, driver, and company.
 - 3. Special regulations related to certain roads requiring permits.
 - 4. Special regulations related to weather conditions and equipment application.

INSTRUCTIONAL OBJECTIVES

KIOBJECTIVES

Driver must know:

- Regulatory bodies and the roles they play.
- Federal Motor Carrier Safety Regulations (FMCSR).
- Hazardous Materials Regulations exist.
- Basic job and FMCSR requirements.
- General operation of twins in trucking.
- Specific regulatory factors affecting twins.

ATTITUDE OBJECTIVES

The driver must believe:

- That company rules and government regulations are important and should be followed.
- Federal and state efforts to ensure the safety of all drivers who share the public roads are critical to the common good of everyone.
- State and local restrictions on size and weight are important safety issues.
- Hazardous material regulations protect the common good.

Major supporting concepts

- Through the Surface Transportation Assistance Act of 1982, the U.S. Congress required states to permit twin 28-foot trailers on interstate highways and other principal roads.
- Through the STAA, states were required to allow on the interstate system single axle weights of 20,000 pounds and tandem axle weights of 34,000 pounds and a gross vehicle weight of 80,000 pounds.
 - The states were prohibited from denying reasonable access by twins from the interstates and designated primary roads to terminals; facilities for food, fuel, repairs and rest; and points of loading and unloading for certain goods carriers.
 - States were required to allow vehicles up to 102 inches wide on interstates and federal-aid highways designed for 12-foot lanes and designated by the Secretary of Transportation (USDOT).
- States and turnpike (toll road) authorities have special rules and regulations for operating tandem trucks and other long combination vehicles. Some of these requirements apply to twins, These rules and

regulations include requirements for special reports, special permits, safety programs, designated highways, restricted materials, traction, tires, fifth wheels, pickup plates, kingpins, pintle hooks, draw bars, axles, brakes, splash and spray suppressants, minimum speed, load sequence, following distance, weight, length, weather restrictions, inspections, staging areas, minimum age, experience/training, insurance, and accident reporting.

- Regulations can influence not only the size and configuration of vehicles operated but also the qualifications of drivers, the practices of carriers, regarding vehicle maintenance and driver supervision, the characteristics of roads used by twins, traffic rules for twins, and twin design and manufacturing.
- The October 30, 1984 Tandem Truck Safety Act (TTSA) amended the STAA to permit twins up to 28.5 feet long and 102 inches wide the same access to points of loading and unloading as household goods carriers.
- Some twins may only be operated under special rules on some roads (in some states or localities) and may require special permits to be operated.
- Local access: Three approaches are currently (1985) used to provide access for LCVs to and from designated highways:
 - 0 Staging areas: turnpikes which allow longer combinations generally have staging areas on or adjacent to the right-of-way so that trucks can be broken into shorter combinations. The truck operator either stations a second tractor nearby to transport the extra trailer beyond the designated route, or the extra trailer is left at the staging area until the original tractor can return for it.
 - Access zones: When the nationwide network for the shorter Western Doubles or twins was mandated by the STAA of 1982, the states were required to provide for “**reasonable access**”. Most states responded by allowing twins to travel within a specified distance of the network, subject to various restrictions. Local access ranged from less than a mile to practically the entire state.
 - 0 Designated access highways: Some states allow carriers to use specific highway segments that can accommodate particular vehicles.

- Reasonable Access: The FHWA issued a final rule on June 1, 1990 that amends "reasonable access for commercial motor vehicles with lengths and widths authorized by the surface Transportation Assistance Act of 1982". The access rule:
 - Defines "terminal" as a location where freight originates, terminates or is handled in the transportation process, or where carriers have operating facilities;
 - prohibits states from restricting access within one mile from the national highway network, except for specific safety reasons on individual routes;
 - states that States that allow specific vehicles access on an individual route must provide access on that route to all vehicles of the same type. Distinction between vehicle types must only be based on significant differences in their operating characteristics;
 - prohibits blanket restrictions on 102 inch wide vehicles;
 - vehicle dimension limits shall not be more restrictive than federal requirements;
 - all states must have an access review process, except those with laws authorizing the operation of STAA dimensioned vehicles on all public roads and highways.;
 - states without FHWA approved access provisions in effect by June 1, 1991, must follow the requirements stated in the final rule.

MATERIALS

Classroom instruction must be supported by instructional material, transparencies, wall charts, or individual class handouts. Copies of the Federal Motor Carrier Safety Regulations (FMCSR) and the Hazardous Materials guide should be used as reference materials.

1.3 DRIVER QUALIFICATIONS

Purpose

This unit provides classroom instruction on the federal, state and local governmental laws, rules and regulations which define twin driver qualifications. This is to include discussion on medical examination, drug screen, certification, and basic health maintenance such as diet, exercise, and mental health. Emphasis is placed on avoidance of alcohol and drug abuse and the avoidance of fatigue.

Outline of Suggested Content

☐ Federal government

A. U.S. Department of Transportation (DOT)

1. Federal Highway Administration (FHWA).

a. Federal Motor Carrier Safety Regulations (FMCSR).

- Physical requirements.
- Medical examination.
- Drug screen.
- Application requirements.
- Knowledge requirements.
- Skill requirements.
- Hours of service requirements.

b. Hazardous Materials Regulations (HMR).

- Knowledge requirements.
- Skill requirements.

☐ State and local governments

A. States regulate driver qualifications.

1. Issue classified licenses with endorsements to drivers.

B. States set driver qualification laws.

1. Age requirements.
2. Knowledge requirements.
3. Skill requirements.
4. Experience requirements.

C. State and local governments or turnpike authorities may set twin driver specific qualification regulations.

❑ **Personal health and driving**

A. Basic physical requirements.

1. Mental and physical health.
2. Maintaining a good diet.
3. Exercise.

B. Fatigue and driving.

1. Causes of fatigue.
2. Effects of fatigue.
3. Dealing with fatigue.

C. Alcohol and driving¹

1. Myths and facts.
2. How alcohol works.
3. How alcohol affects driving.
4. Risks of drinking and driving.
5. Sobering up.
6. Federal law and truck drivers drinking.

D. Drugs and driving.

1. Effects of major categories of drugs
2. Rules for using medically prescribed or over-the-counter drugs.

E. Mental health

1. Stress leads to driver error.
2. Job conditions that lead to physical and mental fatigue.
3. Living habits and problems can affect job performance.

• **1 Driver training and professionalism**

A. Knowledge deficiencies, myths vs. facts.

B. Skill acquisition requires minimum knowledge.

C. Performance is enhanced through knowledge and skill acquisition.

D. Training can minimize reliance on experience.

E. Training enhances on the job experience*

F. Professionalism is a product of knowledge, skill and attitude.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Meet USDOT, FHWA qualification and certification standards for driving twins.
- Meet state and local licensing and qualification standards for driving twins.
- Meet carrier qualification and certification standards for driving twins.
- Not use or possess alcohol and / or drugs that would affect his driving function, before or while operating twins.
- Use proper diet, exercise, and rest to remain alert while driving.
- Minimize fatigue through proper rest while on or off duty.

KNOWLEDGE OBJECTIVES

Driver must know:

- Federal Motor Carrier Safety Regulations (FMCSR) for qualification and certification to drive twins.
- State regulations for qualification and certification to drive twins.
- Carrier qualification and certification standards for driving twins.
- The effects of alcohol, drugs, poor diet, fatigue, poor vision, hearing and general health on safety.
- The background, experience and character requirements for being a safe, successful, professional twins driver.
- The importance of training and the role it plays in professional driving.

ATTITUDE OBJECTIVES

The driver must believe:

- That company rules and government regulations are important and should be followed.
- Federal and state efforts to ensure the safety of all drivers who share the public roads are critical to the common good of everyone.
- Safe operation of a motor vehicle demands that the operator be physically and mentally fit.
- That physical and mental fitness requires proper rest and diet, good health, and avoidance of alcohol and other drugs.

Major supporting concepts

- o States and turnpike (toll road) authorities have special rules and regulations for operating tandem trucks and other long combination vehicles. Some of these requirements apply to twins. These rules and regulations include requirements for minimum age, experience and training.
- o Regulations can influence not only the size and configuration of vehicles operated but also the qualifications of drivers.
- o Some states may require that multiple trailer combination vehicles be operated only by drivers who have been fully trained, are well skilled, and have experience operating commercial vehicles=
- o Several states have a minimum age requirement (usually 25 or 30) for drivers of LCVs. Some require that LCV drivers have extensive experience driving tractor-semitrailers and that they show 3 to 5 years of safe driving prior to being granted a license.
- o Some states require operators of multiple trailer combination vehicles to have their driving records reviewed to determine whether the driver meets minimum requirements for safe driving. Great weight is given to violations (such as speeding, reckless driving, and operating while under the influence of alcohol or drugs) that indicates the driver has exhibited disregard for the safety of the public.
- o Experience per se, does not automatically guarantee increased skill and progressively upgraded performance (e.g., 20 years of driving experience may mean one year of experience multiplied 20 times). There are many levels or degrees of experience. When we refer to good experience we mean gainful experience -- the kind where the driver gains in skill, practical knowledge or wisdom by observing, doing, or driving in situations and then applying this advantage successfully in later similar situations.
- o One objective of any training effort is preparedness. The more driving skill that is obtained in a controlled environment, the less remains to be learned on the job. Therefore, an effective training system can be expected to minimize the reliance on experience to teach safe practices.
- o Drivers must have adequate driver training, both on the road and in the classroom, to make them aware of the variables that influence the controllability and maneuverability of the multiple trailer configurations and how these variables compare to and contrast with those that affect operation of the semi-trailer combination. Drivers should not be driving twin trailer combinations without this specialized training.

- It is reasonable to hypothesize that: since control problems arise primarily when the combination of vehicles (twins) is required to perform a maneuver that is more severe than maneuvers experienced in everyday, routing driving, then drivers need to have the opportunity to learn how to react properly when faced with these conditions.
- Recurrent training of drivers is important to keep experienced drivers up to date; it also helps to identify bad habits that may have developed over time and provides the opportunity to prescribe corrective training.

MATERIALS

Classroom instruction must be supported by instructional material, transparencies, wall charts, or individual class handouts which support the instructional objectives. Copies of the Federal Motor Carrier Safety Regulations (FMCSR) and the Hazardous Materials guide should be used as reference materials.

1.4 VEHICLE CONFIGURATION FACTORS

Purpose

This unit provides classroom instruction on the key vehicle components used in the configuration of combination vehicles. The unit serves to provide familiarization with various vehicle configurations or combinations. It also provides instruction on the specific factors or rationale associated with twin configurations.

Outline of Suggested Content

☐ Introduction

- A. Vehicle familiarization.
- B. Definition of terms.

☐ Tractor cab design

- A. Conventional
- B. Cab over engine (COE)

☐ Tractor axle configuration

- A. Single axle (steer and one rear axle).
- B. Tandem axle (steer and two rear axle).
 - 1. Twin screw (both rear axles capable of power).
 - 2. Tag axle (one power axle, one dead axle).
 - a. Pusher (one power axle behind non-power axle).
 - b. Puller (one non-power axle behind power axle).

•1 Basic full or semi trailer types with or without pintle hook

- A. Basic width's 96 inch and 102 inch.
- B. Basic length vary from 27 foot to 48 foot.
- C. Dry box or freight trailers of varying lengths.
- D. Furniture vans of varying lengths.
- E. Refrigerated trailers of varying lengths.
- F. Flat bed trailers and car haulers of varying lengths
- G. Tank (dry or liquid) trailers of varying lengths.
- H. Other specialized trailers of varying lengths some in excess of 48 feet long.

CI Trailer axle configurations

- A. Single axle .
- B. Tandem axle.
- C. Specialized axle configurations.

CI Converter dolly

- A. Single axle, type A, B, or C.
- B. Tandem axle, type A, B or C.

CI Vehicle configurations

- A. Tractor semitrailer.
- B. Western double or twin.
 - 1. A, B or C-train.
- C. Canadian double or twin.
 - 1. A, B or C-train.
- D. Rocky mountain double.
- E. Turnpike double.
- F. Triple trailer.

☐ **Articulation factors**

- A. Number of axles .
- B. Number of articulation points.
- C. Type and number of converter dollies or draw bars.

☐ **Axle arrangement factors**

- A Transfer of weight to pavement via axle arrangement.
 - 1. Number of axles.
 - 2. Spacing of axles.
- B. Width of axles 96 inch versus 102 inch.
 - 1. Roll stability.
 - 2. Cornering.
 - 3. Tracking and off-tracking.

- **I Matched equipment factors**

- A. Length of trailers.
- B. Width, 96 inch vs. 102 inch.
 - 1. Trailer body width vs. axle width.
 - 2. Effect on trailer placement,
- C. Weight of trailer
- D. Age of equipment.
- E. Component compatibility of tractor and trailers.
 - 1. Hitching and dolly.
 - 2. Suspensions.
 - 3. Braking systems=

- **Trailer placement rules, regulations and policies**

- A. Trailers of equal length, the heavier trailer must lead.
- B. Trailers of equal weight, the longer trailer must lead.
- C. Trailers of unequal length.
 - 1. Regulations may require the longer trailer to lead.
 - 2. Regulations may require the heavier trailer to lead.

INSTRUCTIONAL OBJECTIVES

KNOWLEDGE OBJECTIVES

Driver must know:

- o The name and function of basic tractor cab designs, types and axle configurations and their functional relationship to vehicle configuration.
- o The name and function of basic trailer designs, types and axle configurations and their functional relationship to vehicle configuration.
- o The name and function of basic converter dolly designs, types and axle configurations and their functional relationship to vehicle configuration.
- o The name, components and function of various vehicle configurations to include standard tractor semitrailer, western doubles or twins, Canadian twins, rocky mountain doubles, turnpike doubles and triples.

- The name, function and characteristics of A, B and C converter dollies and how they make up an A-train, B-train and C-train.
- The factors affecting the articulation of various vehicle configurations to include number of axles, axle placement, axle width vs. trailer body width, trailer length, number of articulation points, and the type and number of converter dollies or drawbars.
- The component compatibility factors which affect the overall performance of a combination vehicle to include trailer(s) and dolly(s)' age, manufacturer, component (brakes, suspension, etc.) suppliers, etc.
- The basic rules, regulations and policies governing trailer placement.

ATTITUDE OBJECTIVES

The driver must believe:

- That proper trailer placement and weight distribution is a basic requirement for safe and efficient operation.
- That component compatibility factors are important and must be taken into consideration while operating combination vehicles.

Maior supporting concepts

- States and turnpike (toll road) authorities have special rules and regulations for operating tandem trucks and other long combination vehicles. Some of these requirements apply to twins.
- In addition to the number of axles, the fundamental differences among types of vehicles are the number of articulation points. These points are defined as hitches, pivot points, or connecting points.
- The basic configuration, meaning the number of hitches, determines whether the vehicle is a single unit truck, truck with full trailer, **tractor**-semitrailer, twin, double, or triple.
- A conventional combination (tractor & semitrailer) has one articulation point. Vehicle combinations with two articulation points would be full trailers pulled behind trucks, B-train configurations and doubles with dual (double) drawbars.
- Both twins and tractor semitrailers rely on four axles under the trailer(s) to carry the bulk of vehicle load. They differ in how these axles are spaced. On twins the axles are spaced relatively far apart, generally no closer than nine feet. On tractor semitrailers the axles are usually grouped in pairs, or tandem axles, where the space between the axles is just four feet.
- The loads on twins are usually distributed less uniformly among their five axles than the loads on five axle tractor semitrailers.

- It should be noted that the 102 inch (axle width) wide vehicle offers greater roll stability than the 96 inch width axle. The driver should recognize this factor.
- The overall length of the truck, the length of each trailer, the distance from the point of articulation to the rear axle of semitrailers, and the spread between consecutive axles influence the road space requirements of the truck, that is, turning & cornering ability and degree of off-tracking.
- For carriers with fleets of twins of mixed width's, there may be some mixing of wider 102 inch semitrailers with dollies designed for 96 inch trailers,
- If a 102 inch trailer box is placed on a converter dolly designed for 96 inch wide trailer, load overhang will result. This will enhance the potential for toad rocking and shifting, especially on curves.
- Because fleets will always be interchanging trailers among different tractors and mating newer equipment to older equipment, compatibility will always be an issue.
- Tractors and trailers are manufactured separately by different companies in separate segments. Broad ranges of performances exist for tractors, trailers, and other components. Some of the performance ranges may be incompatible with other parts of the vehicle system.
- When mating trailers of equal length, the heavier trailer should always lead. The weight differential at which one trailer becomes "heavier" varies among states. A few states have determined the threshold of significant weight difference to be from 1 ,500 to 5,000 lbs. Some simply require the heavier of any two units in tandem to be the lead.
- The length of the trailer may be a factor in it's placement if State regulations require the longer trailer first.
- The most common multi-articulated vehicle in operation in the U.S. is a tractor-semitrailer pulling one or more full trailers, Each full trailer, in this case, consists of a semitrailer whose forward end is supported by a dolly which 1) articulates in yaw relative to the semitrailer, 2) is connected to the towing unit by a single pintle hitch, and 3) has one or more axles which are non-steering relative to the dolly frame. this configuration is commonly referred to as an A-train*

MATERIALS

Classroom instruction must be supported by instructional material, syllabus, transparencies, wall charts, or individual class handouts which support the instructional objectives.

SECTION 2 - Basic Operation

The units in this section cover the interaction between trainee drivers and the vehicle. They are intended to teach driver trainees how to inspect, couple and uncouple twin trailers, ensure the vehicles are in the proper operating condition, and control the motion of twins under various road and traffic conditions.

Six units comprise this section:

UNIT: SUGGESTED CLOCK HOURS OF INSTRUCTION

UNIT		CLASS-ROOM	LAB	RANGE	STREET	TOTAL
2.1	Inspection	2	4			6
2.2	Coupling And Uncoupling	2		3		5
2.3	Basic Control And Handling	0.75		2		2.75
2.4	Basic Maneuvers	0.75		4		4.75
2.5	Turning, Steering & Tracking	1		2		3
2.6	Proficiency Development	0.5		5	8	13.5
TOTAL		7	4	16	8	35

2.1 INSPECTION

Purpose

This unit provides instruction on the systematic vehicle inspection of twin tractor trailers. This is to include pre-trip, enroute, and post-trip inspection procedures. While vehicle inspections are common in all commercial motor vehicle operations, some factors are peculiar to twin trailer combinations. Emphasis is placed on component failure recognition.

Outline of Suggested Content

- ☐ **Introduction to vehicle inspections**
 - A. Pre-trip vehicle
 - B. Enroute
 - C. Post-trip
- ☐ **Pretrip inspection procedures**
 - A. Details of a good inspection.
 - B. Federal requirements.
 - C. Inspection procedures.
- ☐ **Enroute inspection procedures**
 - A. Details of a good inspection.
 - B. Federal requirements.
 - C. Inspection procedures.
- ☐ **Post-trip inspection procedures**
 - A. Details of a good inspection.
 - B. Federal requirements.
 - C. Inspection procedures.
- ☐ **Additional procedures for reporting**
 - A. Malfunctions.
 - B. Equipment lost, stolen, defective.
 - C. Physical damage to tractor, trailer or dolly.
 - D. Additional Company rules, policies, procedures.

☐ **What to look for when inspecting tractor, trailer and converter dolly**

- A. Exterior lights working.
- B. Horns working.
- C. Splash guards not damaged.
- D. Fluid levels ok and no signs of leaks.
- E. Belts and hoses ok.
- F. Steering system ok.
- G. Tires, wheels, lugs and rims ok.
- H. Spring & shock absorbers ok.
- I. Brakes, drums and linings ok.
- J. Axle seals ok.
- K. Doors and mirrors ok.
- L. Emergency reflectors ok.
- M. Fuel tanks and battery box ok.
- N. Air & electrical lines ok.
- O. Fifth wheel assemblies ok.
- P. Landing gear & sliding tandems ok.
- Q. Brake system ok.
- R. Gauges ok.
- S. Heater & defroster ok.
- T. Windshield, wipers and windows ok.
- U. Panel lights & inspection stickers ok.
- V. Steering wheel ok.
- W. Fire extinguisher ok.
- X. Cargo & securement equipment ok (if present).

☐ **Vehicle walk around sequence**

- A Introduction.
- B. Methodology.
- C. Steps to follow.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Inspect and determine the condition of critical combination vehicle components, including instruments and controls; engine and drive train; chassis and suspension; steering system; air brake system; converter dolly; coupling system; emergency equipment; and cargo securement devices.
- Perform pre-trip inspections on twins in a regular, systematic sequence that is accurate uniform and time efficient.
- Perform enroute inspections by monitoring instruments and checking mirrors for signs of trouble; making periodic roadside inspections of critical components; and meeting enroute requirements for transporting hazardous materials.

While listening and feeling for indications of malfunctions is a normal part of performing enroute inspections, the driver of twins must be cautious to the fact sensory feedback is more seriously impaired when driving twins than for tractor semitrailers.
- Perform post-trip inspection by making accurate notes of actual and suspected component abnormalities or malfunctions.

KNOWLEDGE OBJECTIVES

Driver must know:

- Procedures for pre-trip, enroute, and post-trip vehicle inspection procedures.
- A systematic process to assure a rapid and complete inspection.
- The effect of undiscovered malfunctions upon safety, effectiveness, and economy.
- The importance of correcting malfunctions quickly before they pose a hazard to the driver or other road users.
- Federal, state, and other regulations governing vehicle inspections, including special regulations for hazardous materials cargo.

ATTITUDE OBJECTIVES

The driver must believe:

- It is the drivers obligation to insure that the vehicle is in safe operating condition before taking it out on the road and to cease operating it if an unsafe condition is discovered.
- The consequence of breakdowns and accidents justify the time spent on the vehicle inspections.

Major supporting concepts

- Because of the greater number and flexibility of trailer couplings in twins, their drivers are less able to sense component failures or malfunctions such as brake imbalance, tire failure, suspension or coupling problems etc.
- During the first few miles of driving (during a trip), the driver conducts a deliberate test of all vehicle systems. The drivers refer to this as the three mile check. by doing this the driver is able to determine whether the truck is properly loaded and responding satisfactorily. It should also be noted that professional drivers continue to make these same kinds of deliberate system checks throughout their runs. The three mile check is different in that it is more concentrated.
- The Model Driver's Manual for Commercial Vehicle Driver Licensing states that during a trip the driver should check critical items during stops. These are: Tires, brakes, lights, brake and electrical connections to trailers, trailer coupling devices and cargo securement devices.

MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals portraying, from the driver's point of view, the hazards most commonly encountered by twin drivers. Also required are printed or visual materials that describe common hazards and the frequency with which they are encountered and materials that review commentary driving techniques.

On range instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and or vehicle safety inspection criteria work sheet.

TRAINEE CHECKLIST: VEHICLE SAFETY INSPECTION CRITERIA

A. EXTERIOR LIGHTS

1. Demonstrates high and low beam headlights, signals, brake lights, emergency flashers and clearance lights.

PASS FAIL

PASS	FAIL
------	------

B. HORNS

1. Demonstrates horn works properly. (air & electric)

PASS	FAIL
------	------

C. SPLASH GUARDS

1. Demonstrates Splash Guards are present, firmly attached and are not damaged,

PASS	FAIL
------	------

D. FLUID LEVELS & LEAKS

1. Demonstrates method of checking fluid levels. This includes radiator, motor oil, transmission fluid (if accessible), and power steering fluid.
2. Checks for fluid Leaks.

PASS	FAIL
------	------

E. BELTS AND HOSES

1. Identifies and checks condition of belts and hoses.
This is to include but not limited to: (Circle item missed)

<u>Belts</u>	<u>Hoses</u>
alternator	power steering
air compressor	water & radiator
fan / water pump	smog pump
air conditioner	fuel

PASS	FAIL
------	------

F. STEERING SYSTEM

1. Identifies and checks condition of steering gear box, pitman arm, steering knuckle arm, lower control arm and tie rod ends.

PASS	FAIL
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G. TIRES, WHEELS, LUGS, RIMS

1. Checks tires for same height, width, type, excessive / unusual tread wear, bumps, cuts, duals not touching, objects between duals, etc.
2. Checks wheels / rims for cracks, welds, bent rims or other damage.
3. Checks all lugs are present and tight. Looks for rust around lugs.
4. Checks hub odometer for damage.

PASS	FAIL
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H. SPRINGS AND SHOCK ABSORBERS

1. Checks springs, fur missing or broken leaves or poor alignment.
 - Air ride bellows nut leaking, properly inflated.
 - Height control arm nut bent, operating properly.
2. Check fur loose or broken u-bolts, spring hangers or shackles.
3. Checks fur loose, broken or leaking shucks.

PASS FAIL

I. BRAKES, DRUMS, LININGS

1. Checks condition of brakes including linings and drums fur excessive or unusual wear or damage.
2. Checks push rods and slack adjusters fur proper adjustment.

J. AXLE SEALS

1. Checks axle seals fur exterior cracks or leakage around wheel hubs.

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K. DOORS AND MIRRORS

1. Checks that passenger & cargo doors operate ok, hinges are functional & doors are secure.
2. Checks mirrors fur proper mounting, adjustment, damage, and visibility.
3. Grab handles secure, no loose or missing bolts.

L. EMERGENCY REFLECTORS

1. Identifies locations of reflectors. All are in fully serviceable condition. (three required)

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M. FUEL TANKS & BATTERY BOX

1. Checks that tanks are nut damaged and are secure, cap gasket is in place, caps are tight and there is no leakage.
2. Checks crossover line fur leaks and nut hanging lower than axle.
3. Checks battery box mounting, & cover. Batteries secured against movement, cases nut damaged or leaking. Fluid in batteries at proper level, cell caps secure.

N. AIR / ELECTRICAL LINES AND CONNECTORS

1. Checks air / electrical lines fur damage and/or leaks.
2. Checks that connectors are in good condition and firmly attached.

O. FIFTH WHEEL ASSEMBLY (TRACTOR & DOLLY)

PASSFAIL

1. Identifies the following parts:
 - a. king pin,
 - b. locking pin,
 - c. safety latch,
 - d. release handle.
1. Checks that fifth wheel assembly does not have broken or damaged parts, that assembly is firmly attached to tractor or dolly, and that trailer is firmly attached to the fifth wheel.

P. LANDING GEAR / SLIDING TANDEM

1. Checks that landing gear is fully raised, has no missing or damaged parts and handle is secured.
2. Sliding tandem is locked & has no visible damage, worn or missing parts. Flexible air lines not cracked, crimped or otherwise damaged. Lines are secured against tangling, dragging, etc.

Q. BRAKE SYSTEM

1. Air compressor cuts in at 85 PSI. Minimum.
2. Air compressor cuts out at 125 PSI max
(Acceptable cut out range 110 to 125 PSI)
3. Static pressure loss no greater than 3 PSI for a combination vehicle. (2 PSI single vehicle)
4. Applied pressure loss no greater than 4 PSI for a combination vehicle. (3 PSI single vehicle)
5. Low pressure warning device light or alarm activates between 60 and 80 PSI.
6. Emergency / parking system operates properly,
Emergency brake sets up between 20 and 40 PSI.
7. Pull test tractor park brake.
8. Rolling brake test complete system.

R. GAUGES (OTHER THAN AIR)

1. Identifies and explains the following gauge / readings

- a. Oil Pressure
- b. Fuel
- c. Temperature
- d. Ammeter/Voltmeter
- e. Speedometer
- f. Tachometer
- g. Brake application
- h. _____

PASS FAIL

S. HEATER / DEFROSTER

1. Identifies and activates heater / defroster.

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T. WINDSHIELD, WIPERS AND WINDOWS

- 1. Windows free of any condition which obstructs view of driver or passenger.
- 1. Wipers function properly.

U. PANEL LIGHTS / INSPECTION STICKER

- 1. Identifies indicator lights on instrument panel.
- 2. Identifies and explains the purpose for inspection sticker.

V. STEERING WHEEL

1. Steering wheel play not in excess of 10 degrees.

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W. FIRE EXTINGUISHER

- 1. Secure in holder.
- 2. Inspection plate. Classification _____
- 3. Pressure gauge works. (charged)
- 4. Wire / plastic seal unbroken.
- 5. Pin secured. (if applicable)
- 6. Inspection tag dated within 12 months

TOTALS:

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FINAL SCORE:

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2.2 COUPLING AND UNCOUPLING

Purpose

This unit provides instruction on the procedures for coupling and uncoupling twins. While vehicle coupling and uncoupling procedures are common in all tractor semitrailer operations, some factors are peculiar to twin trailer combinations. Emphasis is placed on safe operating procedures.

Outline of Suggested Content

☐ Introduction to hitching mechanisms

- A. Tractor fifth wheel.
- B. Trailer kingpin and bed plate or skid plate.
- C. Pintle hook.
- D. Converter dollies.
 - 1. A-dolly, single drawbar.
 - 2. B-dolly, double drawbar.
 - a. Non steering capability.
 - b. Wheel steering capability.
 - 3. C-dolly, double drawbar with steering mechanism.
 - 4. Jifflox
 - a. Used as a converter dolly for hooking second trailer.
 - b. Can also be rigidly locked into frame of tractor to add a second axle.
 - 5. Draw bar.
 - 6. Safety chains or cables.
 - 7. High speed yaw locking mechanisms and snubber devices.

☐ Combination

- A. Trailer hand valve.
- B. Tractor protection valve.
- C. Trailer air supply control.
- D. Trailer air lines.
- E. Hose couplers.
- F. Trailer air tanks.

G. Shut off valves.

1. Rear of front trailer.
2. Converter dolly air tank drain valve.
3. Rear of second trailer.

H. Trailer service, parking and emergency brakes.

CI Coupling routine includes

- A. Maneuver.
- B. Inspect for readiness.
- C. Hook first trailer.
- D. Inspect & test coupling.
- E. Maneuver.
- F. Inspect for readiness.
- G. Hook converter dolly.
- H. Hook second trailer.
- I. Inspect /test coupling of tractor-trailer-dolly-trailer unit.

CI Detailed step by step coupling procedures

A Follow checklist.

☐ **Detailed step by step uncoupling procedures**

A Follow checklist.

• I Load sequencing and trailer placement

- A Importance of uniform weight distribution among axles.
- B. State Regulations.
 1. Usually heavier trailer first if both trailers are of equal length.
 2. Weight differential for trailer placement varies by state.
 3. Considerations for width and height.
- C. Discussion on brake induced instability.

☐ **Summary of safety concerns**

- A Proper procedures reduce the likelihood of accidents occurring.
- B. Examples of accidents caused by improper coupling or uncoupling.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- 0 Align the tractor properly to connect with the trailer.
- Secure the trailer against movement.
- 0 Back the tractor properly into the trailer kingpin without damage.
- Properly connect the converter dolly to the lead trailer.
- 0 Connect electrical and air lines properly.
- Back the converter dolly into the trailer kingpin without damage*
- 0 Perform mechanical and visual checks to make sure coupling is secure.
- Set in-cab air brake controls properly.
- 0 Retract and secure landing gear after coupling is secure.

KNOWLEDGE OBJECTIVES

Driver must know:

- 0 The name, location and function of each of the primary controls, instruments and gauges required for coupling and uncoupling twins.
- 0 The name, location and function of all of the hitching mechanisms and their associated components required to couple and uncouple twins. This is to include fifth wheels, kingpins, converter dollies, jifflox, draw-bar, pintle hook, etc.
- 0 The name, location and function of all of the air brake and electrical components required to couple and uncouple twins. This is to include trailer hand valve, air tanks, air lines, electrical lines, shutoff valves etc.
- The order, sequence and direction of vehicle manipulations and movements required to position the tractor, lead (first) trailer, converter dolly and rear (second) trailers in position for a safe and successful coupling and uncoupling.
- The procedures for pulling various converter dollies safely.
- The hazards of improper coupling and uncoupling.

SKILL OBJECTIVES

Driver must:

- Align the units, tractor, first (lead) trailer, dully and second trailer.
- Back the trailer to achieve sufficient force to luck the fifth wheel on the tractor and / or converter dully to the kingpin on the first (lead) and second (rear) without damaging the kingpin.
- Pull against the kingpin to check the connection without abusing the equipment.

ATTITUDE OBJECTIVES

The driver must believe:

- Following proper coupling and uncoupling procedures is important and will reduce the likelihood of injury or accidents.
- Careless coupling and uncoupling is very dangerous.
- That accidents caused by improper coupling and uncoupling are always preventable.

Maioꝛ supporting concepts

- The order, sequence and direction of vehicle manipulations and movements required to position the tractor and / or one or both of the trailers in position fur safe and successful coupling is a major safety consideration.
- After “maneuvering the vehicle” the FHWA-OMC lists steps fur “inspecting vehicle components” fur readiness to be coupled. This indicates that a “pre-coupling” inspection should be performed.
- The A-dully is a remarkably simple, inexpensive, light, low maintenance, practical device with no drawbacks other than it significantly contributes to the rearward amplification phenomenon.
- A high percentage of company accidents occur while coupling trailers. In almost every case, if the correct procedure had been followed, the accident would have been prevented.
- When handling the converter dully, exercise precaution in lifting and moving to avoid slipping and straining a muscle. Use a pintle hook equipped tractor to move the dully.
- Be on guard when hooking the dully eye to the pintle hook to ensure hands and fingers are nut injured.

- 0 Because of the greater number and flexibility of trailer couplings in twins, their drivers are less able to sense component failures or malfunctions such as brake imbalance, tire failure, suspension or coupling problems etc.
- 0 To aid the driver in lining up units and to guide the driver during the hooking maneuver, a reference marker should be used to help the driver identify the hook up point.

MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals that demonstrate coupling and uncoupling twins. Also required are printed or visual materials that describe common hazards associated to coupling and uncoupling twins and the consequences of improper procedures.

On range instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and or coupling and uncoupling criteria work sheet.

UNIT 2.2 COUPLING AND UNCOUPLING CHECKLIST

1. Coupling sequence overview

- A Locate rear trailer and spot the assigned converter dolly in line with and in front of rear trailer.
- B. Locate lead trailer and hook up to it in a normal manner. Inspect and test coupling.
- C. Align and back lead trailer to a reference point in front of rear trailer.
- D. Hook converter dolly to lead trailer and make appropriate air, electrical and safety chain / cable connections and perform safety checks.
- E. Back tractor-lead trailer-dolly unit under rear trailer until hook is made.
- F. Raise landing gear and make all necessary electrical and air line connections.
- G. Perform all final safety checks and inspect / test coupling of tractor-trailer-dolly-trailer unit.

2. Coupling tractor to trailer

- A Inspect fifth wheel fur damage, missing parts, grease, jaws open, safety unlock handle in automatic lock position, fifth wheel slider lucked (if so equipped).
- B. Inspect trailer kingpin and skid plate fur damage, inspect area around vehicles and chuck wheels.
- C. Position tractor in front of trailer and back slowly up to trailer nose.
- D. Secure tractor, get out and check trailer height, adjust if necessary.
- E. Connect air lines to trailer and from the cab supply air to trailer.
- F. Luck trailer brakes and back under trailer.
- G. Check connection by slightly raising landing gear and pull forward gently while the trailer brakes are still lucked.
- H. Secure vehicle and visually inspect coupling, connect electrical curd and check air lines.
- I. Raise landing gear, secure crank handle, check clearances fur tractor frame and tires. If trailer is equipped with sliding wheels, check lucking mechanism and position, remove trailer wheel chucks and prepare to leave.

3. Set up second trailer and converter dolly

- A Release dolly brakes by opening air tank petcock or use dolly parking brake control if so equipped.
- B. Position converter dolly in front of second (rear) trailer.

4. Coupling to converter dolly and second trailer

- A. Position tractor-trailer as close as possible to converter dolly.
- B. Move dolly to rear of first trailer and couple it to the pintle hook.
- C. Lock pintle hook and secure dolly support in raised position.
- D. Make sure trailer brakes are locked and/or wheels chocked.
- E. Make sure trailer height is correct and back converter dolly under rear trailer.
- F. Raise landing gear slightly and test coupling by pulling against pin of second trailer.
- G. Make visual check of coupling and connect safety chains, air hoses & light cords.
- H. Close converter dolly air tank petcock, and shut off valves at rear of second trailer (service and emergency shut-offs).
- I. Open shut-off valves at rear of first trailer and on dolly if so equipped.
- J. Raise landing gear completely, secure crank handle and remove wheel chocks.
- K. Charge trailers (push "air supply" knob in) and check for air at rear of second trailer by opening the emergency line shut-off. If air pressure isn't there, something is wrong and the brakes won't work.

5. Pulling a converter dolly

- A. Connect the converter dolly to the lead trailer, assuring the pintle hook is closed and locked, light cord and safety chains attached.
- B. Connect the emergency air lines in the following manner:
 - 1. Connect the emergency air lines from the converter dolly to the rear of the lead trailer emergency air glad hand.
 - 2. Connect the other end of the emergency air line from the converter dolly to the service glad hand of the lead trailer.
- C. Open the emergency glad hand shut off valve and close the service glad hand shut off valve. **NOTE:** This procedure is used to assure that there is an emergency air supply to operate the ram on the pintle hook and to automatically set up the dolly brakes in case of breakaway. It is undesirable, however, to have service air actuate the dolly brakes during normal braking of the tractor and the dolly brakes during normal braking of the tractor and trailer. The light weight of the dolly, when not under load, will allow the brakes to lock up, resulting in tire damage or failure.
- D. Connect the two ends of the converter dolly service air lines together and stow them. This will keep dirt from entering the lines and from dragging on the ground.

6. Uncoupling rear trailer

- A Park rig in a straight line on firm ground. Apply parking brakes so rig won't move. Secure second trailer by chucking the wheels if second trailer doesn't have spring brakes.
- B. Lower landing gear of second trailer enough to remove some weight from dolly.
- C. Close air shut-offs at rear of first (lead) trailer and on dolly if so equipped.
- D. Disconnect all dolly air and electrical lines and secure them.
- E. Release dolly brakes.
- F. Release converter dolly fifth wheel latch.
- G. Slowly pull tractor, lead trailer and dolly forward, out from under rear trailer.

7. Uncouple converter dolly

- A Lower dolly landing gear and disconnect safety chains.
- B. Apply converter gear spring brakes and/or chuck wheels.
- C. Release pintle hook on first (lead) trailer.
- D. Slowly pull clear of dolly.

Warning: unlock the pintle hook with the dolly still under the rear trailer. The dolly bar may fly up, possibly causing injury, and making it very difficult to re-couple.

8. Uncouple tractor from lead trailer

- A Park rig in a straight line on firm ground. Shut off trailer air supply to lock trailer brakes. Ease pressure on fifth wheel locking jaws by backing up gently. Apply parking brakes while tractor is pushing against kingpin. This will release pressure on fifth wheel locking jaws and lever.
- B. Secure lead trailer by chucking the wheels if lead trailer doesn't have spring brakes.
- C. Lower landing gear of lead trailer enough to remove some weight from tractor.
- D. Disconnect all tractor air and electrical lines and secure them.
- E. Release fifth wheel latch by pulling release handle to open position.
- F. Slowly pull tractor forward, unlocking kingpin and stop while tractor frame is still under trailer. Secure tractor, inspect trailer supports, then pull out completely.

2.3 BASIC CONTROL AND HANDLING

Purpose

This unit provides an introduction to basic vehicular control and handling as it applies to twin tractor trailers. This is to include instruction on brake performance, handling characteristics and factors affecting twin stability while braking, turning and cornering. Emphasis is placed on safe operating procedures.

Outline of Suggested Content

☐ **Putting the vehicle in motion**

A. Importance of lap / shoulder belts (FMCSR 392.16).

1. Proper use and function.
2. Safety issues for driver and other road users.
 - a. Increased control of vehicle in emergency reaction maneuvers.
 - b. Increased safety for driver.
 - c. Reduce incidence of driver ejection.

B. Shifting

1. Double clutching.
2. Timing upshift and downshift.
3. Consequences of improper shifting.
4. Progressive shifting techniques.

C. Testing the tractor-trailer-dolly-trailer hookup.

1. How to test the brakes.
2. Feel for imbalance.
3. Visually check if in doubt.

☐ **Stopping the vehicle.**

A. Basic procedures.

1. Smooth deceleration.
2. Positioning for next move.
3. Avoid having to backup.
4. If parking, plan your exit before you park.

☐ **Braking performance is a function of stopping distance and vehicle controllability.**

A. Stopping distance is influenced by a number of factors to include:

1. Friction available between tires and pavement.
2. Brake system characteristics.
3. Distribution of weight on individual axles.

B. Vehicle controllability during brake application is influenced by:

1. The number of axles, articulation points and brake balance between units.
2. The ability to maintain directional control and avoid wheel lock up.
3. The probability that the wheels on one or more axles may lock up.

☐ **Handling characteristics**

A. Twins have different handling characteristics than semi's.

B. Every vehicle has it's own handling and performance characteristics.

C. Combining and or exchanging units changes the handling characteristics of the combined vehicle.

D. Loaded versus empty trailers.

☐ **Handling and stability characteristics**

A. Are affected by:

1. Height of the center of gravity of the cargo being carried.
2. The distribution of the cargo within the trailer.
3. The type of coupling devices used.
4. Road and weather conditions.

B. The handling and stability characteristics most related to safety that are influenced by truck weight, size, and articulation are:

1. Off-tracking.
2. Response to rapid steering.
3. Sensory feedback.
4. Braking.
5. Oscillatory sway.
6. Yaw stability and rollover in steady turns.

C. Empty twins are inherently less stable than loaded twins.

☐ **Summary of safety concerns**

A. Proper procedures reduce the likelihood of accidents occurring.

B. Impaired sensory feedback to the driver.

1. Greater number of trailer couplings in twins.

2. Increased overall flexibility of unit.

C. Examples of accidents caused by improper procedures.

OBJECTIVES

PERFORMANCE

Driver must be able to:

- Perform mechanical and visual checks to make sure coupling is secure.
- Start, warm up and shut down the engine, according to manufacturer's specifications.
- Properly secure himself in the seat using the lap / shoulder belt prior to putting the vehicle into motion.
- Put the vehicle in motion, and accelerate smoothly using double clutching technique.
- Select proper gear for speed and road conditions.
- Bring the vehicle to a smooth stop minimizing any vehicle instabilities.
- Maintain directional control and minimize any vehicular instabilities while making maneuvers.

KNOWLEDGE OBJECTIVES

Driver must know:

- The name, location and function of each of the primary controls, instruments and gauges required for coupling and uncoupling twins.
- The name, location and function all of the air brake and electrical components required to couple and uncouple twins. This is to include trailer hand valve, air tanks, air lines, electrical lines, shutoff valves etc.
- The shifting pattern, procedures, instruments and controls necessary to shift gears properly.
- The manufacturer's specifications for engine operation.

- o The procedures for carrying out the performance objectives.
- o The relationship of wheel base length, articulation, and the number of axles to path of a turn.
- o The factors which affect vehicular stability and handling.
- o The handling and stability characteristics most related to safety that are influenced by truck weight, size, articulation and road conditions.

SKILL OBJECTIVES

Driver must:

- o Coordinate use of accelerator and clutch (double clutching technique) to achieve smooth acceleration and avoid clutch abuse.
- o Properly modulate air brakes to bring vehicle to a smooth stop with no visible signs of instabilities.
- o Adequately judge the stopping distance of unit while in the process of bringing the vehicle to a smooth stop.
- o Coordinate steering, braking and acceleration to take the vehicle through a desired path of travel with no visible signs of instabilities.

ATTITUDE OBJECTIVES

The driver must believe:

- o That use of the lap / shoulder belt will increase his safety and the safety of other road users.
- o That following correct starting, warm-up, braking, turning and cornering procedures is essential to safe and economical vehicle operation.

Maior supporting concepts

- o Under 49 CFR 392.16, the FHWA requires that "a motor vehicle which has a seat belt assembly installed at the driver's seat shall not be driven unless the driver has properly restrained himself with the seat belt."
- o Surveys have suggested that some truck drivers do not believe that restraint systems will afford them a measurable degree of protection in the event of a crash. Some believe that it is best to be thrown from a vehicle in an accident. Although there is clear evidence that restraint use saves lives, some truck drivers apparently believe this to be true only for passenger vehicles. Such beliefs among truck drivers highlight the need for improved education regarding restraint use.
- o Because of their two extra articulation points, greater length and different load distribution, twins have different handling characteristics than tractor-semitrailers.

- Twin trailer drivers must be well acquainted with the capabilities and limitations of their vehicle. Every vehicle, whether tractor only, tractor and single trailer, or a set of twins has its own handling and performance characteristics. Drivers must achieve confidence and acquire familiarity with:
 - the type of vehicle and
 - the vehicle that is to be driven.
- Empty double (twin) trailers are inherently less stable than loaded double units, since the suspension system is set up to perform under maximum load conditions,
- Factors associated with twin trailer stability include the use of a two axle tractor and a short wheelbase tractor, both of which tend to be prevalent with double trailers
- The handling and stability characteristics most related to safety that are influenced by truck weight, size, and articulation are:
 - Off-tracking.
 - Response to rapid steering.
 - Sensory feedback'
 - Braking.
 - Oscillatory sway.
 - Rollover in steady turns.
 - Yaw stability in steady turns.
- The height of the center of gravity of the cargo being carried, the distribution of the cargo within the trailer, the type of connectors being used, and the conditions of the road , are all factors which can affect the stability of twins.
- The type of trailers being pulled and the product or cargo contained in the trailer, can affect the stability of twins. By example, tank trailers loaded with liquid product can experience surge of the product, which can influence stability and handling dynamics.
- The two major components of truck braking performance are stopping distance capability and vehicle controllability during brake applications.
- Stopping distance, measured by the distance it takes for a truck to come to a complete stop after brakes have been applied at a given speed, is influenced by a number of factors, including friction available between tires and pavement, brake system characteristics, and distribution of loads on individual axles
- The more axles on a vehicle and the more articulation points it has, the more difficult it is to balance the brake forces and brake timing between power unit and trailing units.

- Braking controllability is the ability both to maintain directional control and to avoid instabilities such as jackknifing and trailer swing during the braking maneuver.
- Vehicle controllability during braking is related to lockup of the wheels on one or more of the axle sets. When pneumatic tires lock up, or cease to rotate, they are unable to produce the lateral forces necessary for directional stability and control. When lockup occurs on the wheels of the steering axle, the vehicle is unsteerable. When lockup occurs on the wheels of the tractor's rear axle or on the wheels of a dolly's axle, the tractor or dolly is unstable in yaw; the ensuing rapid rotational motion is commonly termed jackknifing. Finally if the wheels of the rearmost trailer axle lockup, that end of the trailer swings outward, a condition commonly termed trailer swing.
- Although twins are larger and sometimes heavier than tractor-semitrailers, there is no perceptible difference in their braking ability, because their brake systems are designed to provide the required torque for the loads carried.
- With properly designed, maintained, and adjusted brakes, comparably loaded twins and tractor-semitrailers have been found to have similar emergency stopping distances. Of equal importance, little difference in controllability under emergency braking has been observed. However, the coupling of an empty trailer (twin) behind a loaded trailer poses a different set of circumstances. The wheels on the empty rear trailer are severely over braked and controllable braking is hampered.
- A trailer brake hand valve (if available in the tractor) should **not** be used for normal or emergency braking. The use of the hand valve, instead of normal foot braking, results in reduced effectiveness and excessive wear of the trailer brakes. This could lead to trailer brake fade or failure. Brake fade on any axle will lead to brake imbalance and reduce overall braking ability affecting stopping distance and vehicle control during braking.

MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals that demonstrate coupling and uncoupling twins. Also required are printed or visual materials that describe common hazards encountered by twins and the consequences of improper safety procedures.

On-range instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and or driver performance criteria work sheet.

2.4 BASIC MANEUVERS

Purpose

This unit provides instruction on the basic vehicular maneuvers which will be encountered by Twin-Tractor-Trailer drivers, This is to include instruction on backing, lane positioning and path selection, merging situations and parking twins. Emphasis is placed on safe operating procedures as they apply to brake performance and directional stability while accelerating, braking, merging, cornering, turning and parking.

Outline of Suggested Content

☐ Backing

A. With single trailer.

1. Steering principles.
2. Rules for safe backing.
3. General procedures
4. Types of backing maneuvers and their application to coupling second unit.
 - a. Straight line backing maneuver,
 - b. 45 degree alley / dock backing maneuver
 - c. Jackknife backing maneuver
 - Must be avoided if hooking to twins.
 - d. Parallel park backing maneuver.

B. With twin trailers coupled.

1. Should be avoided, very difficult to do.
2. Difference with different converter dollies.
 - a. A-dolly, single drawbar.
 - b. B-dolly, double drawbar.
 - Non steering capability.
 - Wheel steering capability.
 - c. C- dolly, double drawbar with steering mechanism.
 - d. Jifflox

☐ **Parking twins**

- A. Always use pull through parking spaces without pull out obstruction.
 - Because parking is most difficult backing maneuver.
- B. Always plan your exit before your park.
- C. Always apply parking brake and chock wheels unless
 - 1. Brakes are very hot.
 - a. Then chock wheels, stop engine, put transmission in gear, and let brakes cool.
 - 2. Brakes are wet in freezing weather.
 - a. Then use brakes lightly before parking to heat up and dry brakes.

CI Lane positioning and path selection

- A. Laws, rules and regulation may restrict lane usage.
- B. Select (legal) lane offering:
 - 1. Best mobility.
 - 2. Least traffic interference.
- C. Straight driving vehicle centered in lane of travel.
 - 1. Coordinate steering input to minimize over or under steering.
- D. Curves
 - 1. Speed adjusted for curve prior to entering curve.
 - **Never shift, brake or heavily decelerate in a curve.**
 - 2. Adjust position in lane prior to entering curve to allow for off-tracking.
 - **Never cut across a lane to straighten out a curve.**
 - 3. Hold lane position without drifting or weaving.
 - 4. Accelerate gently / steadily in curve, pulling the trailers through curve.

❑ Merging

A. Steps for merging onto roadway or freeway from entrance.

1. Check main road for traffic using window and current roadway using mirrors.
2. Activate signal while in acceleration lane.
3. Align the rig with roadway to observe overtaking traffic using mirrors.
4. Adjust speed to as close to the highway speed as possible while in acceleration lane. **Do not over accelerate (speed) on ramp.**
5. Enter roadway and cancel signal.

B. Steps for merging into gaps in traffic

1. Look for gap and signal intention for gap.
2. Align the rig with roadway to observe overtaking traffic using mirrors.
3. Find, locate or select gap.
4. Adjust speed to as close to the speed of the other traffic as possible.
5. Enter gap and cancel signal.

C. Safety concerns:

1. Ramp speed, length and superelevation.
2. Insufficient acceleration speed or lane length.
3. Insufficient gap in the traffic.
 - a. Forced to slow down.
 - b. Forced to stop.

• I Summary of safety concerns

A. Proper procedures reduce the likelihood of accidents occurring.

B. The handling and stability characteristics most related to safety that are influenced by truck weight, size, and articulation are:

1. Off-tracking.
2. Response to rapid steering.
3. Sensory feedback.
4. Braking.
5. Oscillatory sway.
6. Rollover in steady turns.
7. Yaw stability in steady turns.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- 0 Back tractor-semitrailer in straight line, curved paths, 45 degree angle, offset alley, and into a parallel park position.
- 0 Use mirrors to check path and clearances while backing.
- 0 Judge sides, rear, and overhead clearances and path of travel of the trailer.
- 0 Selecting safe parking location, park and leave parking location safely.
- 0 Select proper gear for speed and road conditions.
- 0 Select the lane offering the best mobility and least traffic interference.
- 0 Keep vehicle centered in the lane of travel without drift or weaving.
- 0 Adjust speed to the configuration and condition of roadway.

KNOWLEDGE OBJECTIVES

Driver must know:

- 0 The procedures for backing and parking, lane positioning and merging.
- 0 The correct position in which to place the vehicle before beginning backing or parking maneuver.
- 0 The principles of reverse steering and articulated vehicles.
- 0 The hazards of backing, the importance of avoiding unnecessary backing and the importance of checking the area prior to backing and of using a guide for assistance.
- 0 How to select parking location having easy access and egress with twins.
- 0 The procedures for lane positioning, path selection and merging.
- 0 How to minimize trailer drift and oscillatory sway while maintaining lane position or while merging.

SKILL OBJECTIVES

Driver must:

- 0 Demonstrate coordination of speed and directional control to achieve the desired path while backing or parking*
- o Demonstrate the ability to minimize trailer drift and oscillatory sway while maintaining lane position or while merging*
- o Avoid cutting across lanes of travel to straighten out a curve.
- o Coordinate steering input to prevent over or under steering.
- o Adequately judge the path the trailers will take (off-tracking) as vehicle negotiates left or right curves and turns.

ATTITUDE OBJECTIVES

The driver must believe:

- o That all backing is potentially dangerous, that the best way to avoid backing accidents is by avoiding the need to back.
- 0 That all backing accidents can be avoided.
- o That pull through parking spaces are the safest places to park twins.
- 0 Pre-planning how you will exit is the first step to parking twins.
- o Proper lane positioning is absolutely essential to safe twin operation*

Major supporting concepts

- 0 As a general rule backing with twins is to be avoided. However, there are situations where backing may be unavoidable. These include situations where the vehicle's path is blocked such as an accident or emergency ahead, dead-end streets or alleys, or other driving path obstacles.
- o A combination with **two articulation points** can be backed a considerable distance by a skilled driver. Included among these would be full trailers pulled behind straight trucks, **B-train configurations, and twins or doubles with dual drawbars.**
- o When there are more than two articulation points, combination units can seldom be controlled when backing. Twins with single drawbars can be backed only a short distance until unit becomes misaligned, begins off-tracking and "collapses".
- 0 Drivers must believe that all **backing is potentially dangerous**, that the best way to avoid backing accidents is by avoiding the need to back
- 0 Backing is the most difficult procedure to master.

- 0 While backing a full rig is to be avoided when possible, backing the tractor and one trailer is an essential procedure during the hooking maneuver. During the backing phase of hooking, all safety rules should be employed.
- 0 Twins equipped with single drawbar dollies are typically uncoupled for loading and unloading.
- 0 Special regulations for twins in some jurisdictions and on some roadways may restrict vehicle to travel in particular lanes.
- 0 Special attention in relation to position within lane is required when taking cruise speed curves and turns because of off-tracking tendencies of rearmost trailer. Check for drift on outboard side. There will be less drift if driver has set up the curve properly. Driver must brake or slow prior to curve and then accelerate gently or steadily through it. Proper position and speed reduces danger of slipping into other lanes.
- 0 Avoid cutting across lanes to straighten out a curve.
- 0 Centering the line of sight down the path the vehicle should travel, and steering toward the center of this selected path, will help to prevent over-steering and under-steering.
- 0 Even on a straight road a vehicle will not "hold the path" unless the driver is looking ahead, recognizing each movement away from the desired path, and making early (small) correction for each deviation.
- 0 Drivers must adjust their speed for curves in the road. If you take a curve too fast, the wheels can lose their traction creating a skid or the wheels may keep their traction and the vehicle rolls over. Tests have shown that trailers with a high center of gravity can roll over at the posted speed limit for a curve.
- 0 Braking in a curve is dangerous because it is easier to lock up the wheels and cause a skid or jackknife. Slow to a safe speed before you enter a curve and be in a gear and rpm range that will allow you to accelerate slightly or pull the trailers through the curve.
- 0 Twins may disrupt traffic in freeway merge situations. If the twin is not able to gain enough speed within the acceleration lane to merge or find a gap long enough to safely merge, a problem is created. The vehicle may be forced to slow down or even stop, making it **even** more difficult to find a gap and enter the main flow of traffic.

MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals that illustrate each of the maneuvers to be performed. Also required are printed or visual materials that describe common hazards encountered by twins backing, parking, merging and the consequences of poor lane positioning and path selection.

2.5 TURNING, STEERING AND TRACKING

Purpose

This unit provides instruction on turning situations, steering maneuvers and the tracking of twin trailers. This is to include instruction on trailer sway and off-tracking. Emphasis is placed on maintaining directional stability.

Outline of Suggested Content

□ Turning the vehicle

A. Basic rules.

1. Speed.
2. Lane positioning.
 - a. Starting lane or position.
 - b. Ending lane or lane position.
3. Mirror checks.
4. Shifting.
5. Signalling.

B. Besides the radius of the curve and the weight of the vehicle; other road, vehicle and operator factors determine the safe speed for turning such as:

1. Off-tracking.
2. Coefficient of friction between tires and road.
3. Whether the road is flat, banked or crowned.
4. Condition of shock absorbers, springs, tires, and tire pressure*
5. Driver oversteering or understeering.
6. Braking in a curve (a very dangerous situation).
7. Center of gravity and type of load.
8. Vehicle configuration considerations, i.e. type dolly, etc.

☐ **Turns**

A. Positioning from single turn lane

1. to single lane.
2. to multiple lanes.

B. Positioning from multiple turn lanes

1. to single lane.
2. to multiple lanes.
3. Hold lane position without drifting or weaving.

C. Accelerate gently / steadily in turn, pulling the trailers through the turn.

☐ **Steering**

A. Driver control of three vehicles (tractor & two trailers) each having separate steering characteristics.

1. Tractors have oversteer tendencies.
2. Trailers may have over or understeer tendencies depending on weight and load placement.

B. Smooth steering is critical.

C. Steer the tractor down the road, the twins will follow.

D. Continuous small steering corrections to reduce trailer sway will, in reality, amplify trailer sway.

E. Minimize "steering input" during evasive maneuvers.

F. Role of steering control in:

1. Rollovers.
2. "Crack-the-whip" (rearward amplification).
3. Trailer sway.

☐ **Trailer fidelity (tracking)**

A. Definition.

B. Trailer sway.

1. FMCRS 393.70a "...three (3) inches either side of the path of the tow vehicle."
2. State requirements vary.

C. Causes of trailing infidelity:

1. Fifth wheels.
 - a. Properly mounted.
 - b. Jaws properly adjusted.
 - c. Properly lubricated.
2. Other vehicle components, i.e. tires, suspension, etc.
3. Rough pavement.
4. Load distribution & center of gravity.
5. Driver inexperience.
6. Pintle hook snubbers.
7. Rapid steering movement (high speed).

☐ **Off-tracking**

- A. Definition.
- B. Swept path.
- C. Low speed off-tracking.
 1. Trailer tracks to the inside.
 2. As speed increases off-tracking decreases to zero.
- D. High speed off-tracking .
 1. Trailer tracks to the outside .
 2. Tire slip angles.
- E. Rearward amplification.

• **Summary of safety concerns**

- A. Condition and type of coupling devices
- B. Condition of shock absorbers, springs, tires, tire pressure, etc.
- C. Braking in a curve.
- D. Pulling trailers versus having trailers push vehicle in a turn or curve.
- E. Examples of how directional instabilities can occur.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Position the vehicle for a turn and negotiate turns (left and right) of different degrees and ratios.
- Assume a safe speed prior to entering a turn and completing the turn at neither an excessive nor insufficient speed.
- Select and properly position in the turning lane offering the best mobility and least traffic interference, and complete the turn into the proper lane of travel.
- Negotiate turns without trailer tires crossing demarcation line, touching curb or running off pavement edge.
- Minimize steering input in order to minimize trailer sway.
- Judge sides, rear, and overhead clearances and path of travel of the trailers.
- Observe the rear of the trailer, through the appropriate mirror, while turning.

KNOWLEDGE OBJECTIVES

Driver must know:

- The proper position from which to begin a turn and how to “set up”, execute and recover from a turn.
- The steering characteristics of tractors and trailers and what the driver can do to control rearward amplification.
- The procedures for carrying out the performance objectives.
- How to control trailer drift and oscillatory sway while turning.
- The factors which determine the safe speed for a turn.
- The proper lane to proceed from and to end in when making turns (left and right) from single and multiple lane into single and multiple lanes.
- The basic principle of trailer tracking & off-tracking.
- The differences between low and high speed off-tracking.
- The basic causes of trailer off-tracking and the procedures for minimizing the effect of off-tracking.
- The relationship of wheel base length, articulation, and number of axles to path of a turn.

SKILL OBJECTIVES

Driver must:

- Adequately judge the path the trailers will take (off-tracking) as vehicle negotiates left or right curves and turns.
- Demonstrate coordination of speed and directional control to achieve the desired path of travel.
- Demonstrate the ability to control trailer drift and oscillatory sway while maintaining lane position while turning.
- Coordinate steering input to prevent over or understeering.

ATTITUDE OBJECTIVES

The driver must believe:

- That proper lane positioning is absolutely essential to safe twin operation.
- That smooth steering is critical to maximum trailer stability when maneuvering twins.
- That the best way to minimize the effect of evasive maneuvers (to vehicle stability) is to recognize the situation and begin evasive steering as soon as possible. Early recognition can reduce the severity of the maneuver.

Major supporting concepts

- The driver must be able to position the tractor and trailers appropriately in initiating and completing a turn so as to prevent other vehicles from passing on the wrong side and to minimize encroachment on other lanes.
- The right turn is considered the more critical maneuver because, with the inward tracking of the rear wheels at low speeds, the truck has a greater probability of "cutting" the curb or conflicting with oncoming traffic.
- Twin drivers must give special attention to at least four turning situations where vehicle position adjustment may be required:
 - Left turns: Avoid encroaching upon opposite lanes; avoid swing right first (this gives wrong impression of intentions); being alert to paths of other vehicles and turning points.
 - Wide right turns: Performed when turning into street that is wide enough to handle large turning radius. Driver must be both attentive to requirements and able to skillfully execute them.

- Tight right turns: Driver must know the what, where and how requirements.
- Turning alongside: When two or more lanes are provided for turning traffic, the twin driver should use the outside lane. (left-most lane in right turn; right-most lane in left turn).
- Besides the radius of the curve and the weight of the vehicle; other road, vehicle and operator factors determine the safe speed for turning such as:
 - Off-tracking.
 - Coefficient of friction between tires and road.
 - Whether the road is flat, banked or crowned.
 - Condition of shock absorbers, springs, tires, and tire pressure.
 - Driver oversteering or understeering.
 - Braking in a curve (a very dangerous situation).
 - Center of gravity and type of load.
 - Vehicle configuration considerations, i.e. type dolly, etc.
- In general, short trailing units are less stable than long trailers, and the greater the number of articulation points, the less stable the vehicle.
- There are several types of instability related to steering maneuvers. These include pure rollover, "rear end amplification" of the **rearmost** trailer in a unit ("cracking the whip") as a result of rapid steering maneuver, and trailer sway during straight ahead operation.
- The driver should minimize the amount of steering and turning during evasive maneuvers. This can be done by starting the evasive steering as early as possible. Start as soon as an emergency is recognized. The earlier the driver starts, the smaller the amount of turn that is necessary. Turn only as much as needed. The larger the turn, the greater the chance of a rollover or jackknife.
- When driving twins, the driver is controlling three vehicles, a tractor and two trailers. Each of these units can have separate steering characteristics. The tractor generally has oversteering tendencies, and the trailers may have oversteering or understeering characteristics depending on the type load and weight distribution.
- Numerous explanations have been given for the sway of the rear trailer in twins, these include:
 - Rough pavement.
 - Slack pintle hook.
 - Dry fifth wheels.
 - Driver inexperience.
 - Rapid steering movement at high speed.

- Federal regulations (FMCSR 393.70a) require that when two or more trailers are operated in combination and when the combination is operated in a straight line on a level, smooth, paved surface, the path of the towed vehicle will not deviate more than three (3) inches to either side of the path of the vehicle that tows it.
- State requirements vary and may be more restrictive than the FMCSR regulations.
- Trailer sway can result from a fifth wheel that is poorly mounted or loosely fitted, or one that is dirty or poorly lubricated. The driver must be sure that all fifth wheel plates have a sufficient layer of lubrication.
- In the mirrors, a driver may notice some movement in the second trailer. It is not necessary to make steering corrections to counter the movements. Suggesting that "continuous small steering corrections" are necessary (to correct trailer sway) is exactly opposite of what twin drivers should be trained to do. Continuous corrections create trailer sway. The driver should concentrate on steering the tractor and the trailers will follow.
- The pintle hook is another device that can affect trailer sway. Properly adjusted pintle hook snubbers are required to eliminate slack in the latching mechanism that causes swaying of trailers.
- The ability of trailers to precisely follow the tractor is referred to as "trailing fidelity".
- The trailing fidelity of twins is often less desirable because of :
 - Low- speed off-tracking.
 - High speed off-tracking.
 - Rearward amplification.
- Off-tracking occurs when successive axles on a vehicle follow different paths as a vehicle turns. The distance between the path of the tractor's front axle and the path of the rearmost trailer axle as the vehicle negotiates a particular turn is the amount of off-tracking for that turn. If the axle paths deviate from one another too much, the vehicle cannot stay within its proper lane. Either the front of the vehicle must swing into opposing lanes of traffic, or else the rear wheels must run off the roadway or onto adjacent lanes to make the turn.
- All vehicles offtrack to a certain extent at low speeds, but in general, the longer the vehicle and the fewer the number of articulation points, the greater the off-tracking.
- The slope of the road surface will accentuate low speed off-tracking in the direction of the slope.

- **Low-speed off-tracking:** Two quite different types of off-tracking may affect twins when they make a turn. The most familiar type is called "low-speed off-tracking". Low-speed off-tracking occurs when each axle of the vehicle follows a path which lies inside of that inscribed by the preceding axle. As twins travel around a curved path at increasing speed, low speed off-tracking decreases and actually becomes zero.
- **High-speed off-tracking:** At high speeds, the trailer tracks to the outside of the path of the tractor. High-speed off-tracking occurs when the wheels of the rearmost axle track outside the path of the front most axle. High-speed off-tracking is influenced by the wheelbase dimension, axle loads, number of articulation points, and tire properties. This phenomenon, which occurs mostly on interchange ramps and highway curves where high speeds are possible. This type of off-tracking is small, ranging from about one-half foot for a tractor-semitrailer to about a foot and a half for twins on a 600 foot radius curve taken at 55 mph.
- **Swept path:** The significance of low speed off-tracking becomes more obvious when it is expressed in terms of the "maximum swept path" of the vehicle. The maximum swept path is equal to the sum of the off-tracking plus the vehicle width. If the swept path exceeds the lane width, a vehicle must leave its lane to negotiate a turn.
- At low speeds, twins are more maneuverable than tractor semitrailers because the rear wheels of twins track the path of the front wheels more closely when making turns.

MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals that illustrate each of the maneuvers to be performed. Also required are printed or visual materials that describe common hazards encountered by twins backing, parking, merging and the consequences of poor lane positioning and path selection.

2.6 PROFICIENCY DEVELOPMENT: BASIC OPERATIONS

Purpose

The purpose of this unit is to enable drivers (trainees) to gain the proficiency in basic operation needed to safely undertake on-street instruction in the Safe Operations Practices section of the curriculum.

The activities of this unit consist of driving range (yard) exercises that provide practice for the development of basic control skills and mastery of basic maneuvers. Trainees practice skills and maneuvers learned in Units 2.3, 2.4, and 2.5. A series of basic exercises are practiced on the range until trainees develop sufficient proficiency to drive on-street. Initial on-street practice occurs after sufficient proficiency is developed on range.

Nearly all activity in this unit will take place on the range or under low-density traffic conditions. There is a brief classroom session to familiarize trainees with the exercises they will perform on the range and how their performance will be rated.

Outline of Suggested Content

- **I Introduction to proficiency development exercises (Classroom)**

- A. Description and purpose of range exercises.

- 1. Basic control skills.

- 2. Basic maneuvers (pre-street driving).

- B. Procedures and practice routines.

- 1. Basic control skills.

- 2. Basic maneuvers (pre-street driving).

- C. Standards for performance evaluation.

- 1. Basic control skills.

- 2. Basic maneuvers (pre-street driving).

- D. Safety rules for range exercises.

- **Proficiency development: Basic control (range)**

- A. Instructor demonstration.

- B. Practice exercises.

- 1. Backing -- straight line.

- 2. Turnabout.

3. Forward stop.
 4. Forward serpentine.
 5. Offset alley.
 6. Tight circles -- left and right.
- C. Skill attainment evaluation.
1. Performance testing for basic control skills.
 2. Identification of remedial or additional practice needed to meet standards and/or unit objectives.

CI Proficiency **development: Basic maneuvers (pre-street)**

- A. Instructor demonstration.
- B. Practice exercises (range or low-density traffic conditions).
 1. Starting, upshifting, downshifting and stopping.
 2. Lane - keeping / straight.
 3. Lane - keeping / curve.
 4. Lane - keeping / turn.
 5. Right turns.
 6. Left turns.
 7. Curves.
- C. Practice in basic skills and maneuvers: On-street
(Routes with little to limited amount of traffic)
 1. Starting, upshifting, downshifting and stopping.
 2. **Left** and right turns.
 3. Lane - keeping.
 4. Lane changes.
 5. Negotiating curves.
 6. Situations:
 - a. Straight without significant curves.
 - b. Straight with significant curves.
 - c. Controlled and uncontrolled interchanges.
 - d. Freeway interchanges.
 - e. Hills and grades.

D. Basic vehicle operation evaluation

- Trainee performance is evaluated against a prescribed criteria, including these basic control factors:
 1. **Acceleration:** Smooth acceleration; no jerky, abrupt acceleration from a standing start and when increasing speed,
 2. **Braking:** Smooth, controlled stops, no rebound of front end or sound of exhausting air.
 3. **Stopping point:** Coming to a stop beyond a stop line or other designated stopping point.
 4. **Upshifting:** Stalling, operating out of the designated RPM range; lugging; slipping the clutch; waiting too long to shift up; delayed shift between gears (losing too many RPM); missed shift (having to drop back into another gear); gear clash.
 5. **Downshifting:** Allowing engine speed to exceed or fall short of designated RPM range; gear / engine mismatch resulting in lurch as clutch is released; delayed shift; over or under revving between gears; gear clash.
 6. **Uphill Operation:** Lugging (failure to shift soon enough); excessive loss of speed; roll back when starting from a standing point.
 7. **Starting On An Incline:** Improper coordination of parking brake, foot brake, and throttle resulting in one or more of the following: roll back; stalling engine; or excessive clutch slipping, particularly at high RPM.
 8. **Downhill Operation:** Starting down the hill in too high a gear; failing to maintain steady brake pressure.
 9. **Speed Adjustment/Curves:** Excessive speed in entering turn or at an intersection, as indicated by: sharp lateral acceleration; braking while in a curve or turn.
 10. **Lane-Keeping/Straight:** Touching or crossing lane marking when operating in a straight line.
 11. **Lane-Keeping/Curve:** Wandering back and forth between lines or touching or crossing lane marking while in curve.
 12. **Lane-Keeping/Turn:** Operating outside of the designated lane while in a turn.
 13. **Right Turn:** Right rear wheels cutting across curb or road edge.
 14. **Left Turn:** Beginning left turn too early; cutting across lanes approaching from left.
 15. **Curves:** Wheels not kept within lane markings; failure to steer far left/right to compensate for the off-tracking of the trailers.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to perform the following to the level of proficiency required to permit **safe** entry into on-street instruction:

- 0 Maneuvering through sharp turns (e.g., offset or alley).
- o Maneuvering through a series of sharp turns (e.g., forward serpentine).
- 0 Maneuvering into areas restricted to the rear, sides, and front.
- o Judging the position of the right wheels.
- o Judging clearances at the rear, front and sides.
- 0 Maintaining proper vehicle and engine speed on upgrades and downgrades.

KNOWLEDGE OBJECTIVES

Driver **must** know:

- 0 No new objectives.

SKILL OBJECTIVES

Driver must:

- 0 Coordinate acceleration and braking to maneuver the vehicle with a high level of proficiency.
- 0 Coordinate clutch, throttle and gear shift to maintain engine at proper speed when shifting on upgrades and downgrades.

ATTITUDE OBJECTIVES

The driver must believe:

- 0 No new objectives.

Major supporting concepts

- The purpose of range exercises is to further develop driver skills (taught in previous units) in basic vehicle control and operation by providing instruction and supervised practice in:
 - Timing and coordination in manipulation of vehicle controls (e.g. steering wheel, accelerator, and brake pedal).
 - Safe and efficient techniques for performing such maneuvers as:
 - a. Straight line backing
 - b. Turning about in tight spaces
 - c. Negotiating offset alleys
 - d. Weaving around obstacles in path
 - e. Controlled stops
- Range practice should continue until drivers (trainees) have attained enough vehicle handling judgment and skills to safely engage in street or on-road training lessons.
- Basic control skills and maneuvers tests are used as an objective measuring device to determine when trainees have attained a sufficient degree of knowledge, skill and judgment of vehicle spatial requirements and self confidence necessary to commence the basic street or on-road training.
- Trainees should be provided practice in basic vehicle operation on the range or in low density traffic conditions before going on to more difficult on-road practice,
- In this unit, to allow trainees to concentrate their attention upon vehicle handling, instructors should provide assistance to the trainees by:
 - Reminding them to shift gears when necessary
 - Reminding them to signal and cancel signals
 - Warning them as to potential hazards, excessive speed, insufficient clearance and safety margins
 - Directing them around areas of congestion, low overhead or lateral clearance, reversible traffic lanes, and potential hazards
- The driver communicates with his or her vehicle and the roadway through the steering control, accelerator and braking control.
- To drive the vehicle in situations requiring sharp turning movements (particularly in tight quarters), on hills and in other situations requiring precise movements, twin-trailer drivers need to coordinate use of vehicle controls and make skilled and properly timed actions based on sound judgements and decisions. Techniques and underlying concepts required for developing smoothness and precision in these maneuvers is an important part of the driver training curriculum.

MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals portraying, from the driver's point of view, the hazards most commonly encountered by twin drivers. Also required are printed or visual materials that describe common hazards and the frequency with which they are encountered and materials that review commentary driving techniques.

On range instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist and:

- Rules for range exercises
 - Rules for on-street driving
 - Range diagrams for exercises
 - Driver performance scoring criteria checklist or scoring forms

UNIT 2.6 DRIVER RULES FOR RANGE EXERCISES

- A. Operate vehicles only with the permission of the instructor and when an instructor is supervising you.
- B. Properly attach your lap / shoulder belt prior to putting the vehicle in motion.
- C. Follow all range exercise procedures exactly. If you do not understand an instruction or exercise, ask for help before proceeding.
- D. Only one vehicle may be operated within an exercise layout.
- E. In the case of any malfunction, emergency, or problem, stop and alert an instructor.
- F. Always check on all sides of the vehicle before moving.
- G. When you are observing other trainees' driving, stay well back from the moving vehicles. Do not stand close to a moving truck and never where the driver cannot see you.
- H. Maintain a safe distance between your vehicle and others.
- I. No trainee may drive after drinking any alcoholic beverage nor when taking drugs or other medication that may affect their ability to drive safely.

UNIT 2.6 DRIVER RULES FOR ON-STREET DRIVING

- A. Operate vehicles only with the permission of the instructor and when an instructor is supervising you.
- B. Properly attach your lap / shoulder belt prior to putting the vehicle in motion.
- C. Follow all instructions given by the driving instructor. If you do not understand an instruction, ask for clarification before proceeding.
- D. Alert the driving instructor to any malfunction or potential malfunctions indicated by gauges, warning lights, etc.
- E. Obey all traffic laws.
- F. Carry your drivers license or learners permit, medical certificate, and logbook at all times.
- G. No trainee may drive after drinking any alcoholic beverage or when he / she is taking prescribed drugs or other medication that may affect his/her ability to drive safely.
- H. Check your path carefully before moving.
- I. Trainees in the vehicle who are not driving, must be observing the driver and the road ahead. They may not carry on conversations that will distract the driver.

SECTION 3 - Safe Operating Practices

The units in this section cover the interaction between student drivers, the vehicle, and the traffic environment. They are intended to teach driver trainees how to apply their basic operating skills in a way that ensures their safety and that of other road users under various road, weather and traffic conditions.

Five units comprise this section:

UNIT: SUGGESTED CLOCK HOURS OF INSTRUCTION

UNIT		CLASS-ROOM	LAB	RANGE	STREET	TOTAL
3.1	Interacting With Traffic	2			2	4
3.2	Speed & Space Management	2	2		2	6
3.3	Night Operations	1.25	1		2	4.25
3.4	Extreme Driving Conditions	2	2			4
3.5	Proficiency Development	0.75			24	24.75
TOTAL		8	5	0	30	43

3.1 INTERACTING WITH TRAFFIC

Purpose

This unit provides instruction on the principles of visual search, communication and sharing the road with other traffic. Emphasis is placed on visual search, mirror usage, signalling and/or positioning the vehicle to communicate and understanding the special situations encountered by twins in various traffic situations.

Outline of Suggested Content

- ☐ **Introduction to sharing the road with other traffic.**
 - A. As others see twins.
 - B. Twin trailers can be intimidating to other road users.
 - C. Professional drivers must compensate for the lack of understanding of others with whom we share the road.
 - D. Twins in the traffic stream can influence others sharing the road.
 - E. Twin trailer combinations have additional points of articulation and therefore require additional vigilance and skills.
- ☐ **Visual search techniques**
 - A. Looking ahead
 - 1. Importance of looking far enough ahead.
 - 2. How far and how often to look ahead.
 - 3. What to look for in traffic and road conditions.
 - B. Mirror usage
 - 1. Importance of clean and properly adjusted mirrors.
 - 2. Incorporating mirror adjustment in vehicle inspection procedures.
 - 3. Know the characteristics of various mirrors used.
 - a. Fields of vision.
 - b. Location and extent of blind spots.
 - c. How to read speed and distance of overtaking vehicles.
 - d. How to account for distortion of convex mirrors.
 - e. Amount of distortion and overlap between plane or flat and convex mirrors when used in combination.

4. What to look for in your mirrors.
 - a. Traffic on either side and in back of the vehicle.
 - b. Check your vehicle and the tracking of the trailers behind the tractor.
5. Incorporate mirrors in visual search techniques.
 - a. Check mirrors quickly and frequently, looking back and forth between the mirrors and the road ahead.
 - b. Increase mirror usage during maneuvers such as lane changes, turns, merges and heavy traffic.
 - c. Be aware of blind spots and use your mirrors to compensate. Other traffic has to move into a blind spot. Proper visual search will reduce the probability of someone entering your blind spots unnoticed.

CI Communications

- A. Signal to communicate what you intend to do in turns, lane changes, slowing down and preparing to stop.
- B. Use of brake light to communicate presence or intentions.
- C. Use of four-way flashers to communicate presence or intentions.
- D. Use of headlights to communicate presence or intentions.
- E. Use of horn to communicate presence or intentions.
- F. The way the vehicle is positioned can assist in communicating your intentions or confuse other traffic.
- G. Certain situations such as hazards, severe road conditions, weather conditions or whenever it is difficult to see (night, dawn, dusk) requires special effort to communicate presence and intentions.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Adjust road speed and space around vehicle to accommodate other traffic.
- Clean and properly adjust both flat and convex mirrors on the vehicle.
- Change or adjust mirror settings for trailers of different widths.
- Maintain a minimum 12 second visual search lead time.
- Scan both sides of the road using quick glances and describe roadside and or adjacent vehicle activity.

- Include appropriate instrument panel checks in the visual search pattern.
- Adjust visual search pattern during maneuvers such as lane changes, turns and merges.
- Measure speed and distance of overtaking vehicles.
- Monitor traffic entering and exiting the vehicle's blind spots.
- Monitor trailers and identify signs of vehicle problems.

KNOWLEDGE T I V E S

Driver must know:

- How to compensate for the lack of understanding of others with whom we share the road.
- That other motorists are used to seeing only one trailer and that this perception could cause a hazardous situation.
- That the presence of twin trailers in the traffic stream influences the operation of other vehicles.
- The effects of having additional points of articulation in a twin trailer configuration.
- How to control rear trailer sway or amplification.
- The proper adjustments of the various types of mirrors.
- The difference in images presented by flat and convex mirrors.
- Appropriate visual search techniques for various road, traffic and maneuvering conditions.
- The relationship between speed and sight distance.
- That the first sign of trouble is often perceived by the driver when checking his mirrors.
- The location and extent of blind spots on his vehicle.
- That truck blind spots are a safety concern that can only be reduced through incorporating appropriate mirror usage into visual search techniques.
- When to accentuate turn signals to provide adequate warning without creating confusion.
- State traffic laws for turn signals.
- The importance of signalling for the prevention of accidents.
- That not giving appropriate signals could lead to an accident.
- The conditions under which other drivers may give false signals.
- The appropriate use of the horn is to give warning to others of your presence only when needed.

ATTITUDE OBJECTIVES

The driver must believe:

- 0 That obeying traffic laws is important and will reduce the risks of having an accident.
- 0 That courtesy on the highway is important and is a good safety principle to follow.
- 0 That the perception of how others see professional drivers handling themselves and their vehicles is very important.
- o That a professional driver has a moral obligation to himself and the motoring public to be the best he / she can be.
- 0 Professional drivers must compensate for the lack of understanding of others with whom we share the road.
- o That it is his responsibility to enhance the image of the professional driver on the road and elsewhere.
- 0 That a professional driver is always in control of his vehicle and his emotions.
- 0 That emotional instability can contribute to unsafe acts.
- o That twin trailer combinations have additional points of articulation and therefore require additional vigilance and skills.
- o That the ability to respond to changing road conditions requires proper visual search techniques.
- o That development of good visual search habits is essential to safe driving and will reduce driver fatigue.
- o Signaling one's intentions is essential to avoiding accidents.
- o improper use of the horn, signals, and the cb is potentially dangerous and will tarnish the image of the professional driver.

Maior supporting concepts

- o The professional driver has a moral obligation to himself and the motoring public to be the best he / she can be as he / she shares the road with other roadway users.
- 0 Most highway users are unaware of the limitations and longer space requirements of twin tractor trailers. The longer, wider tractor trailers are more difficult to see around and require longer distances to pass them.
- 0 Other motorists are used to seeing only one trailer behind the tractor. In some cases they may assume the truck is past and move into the second trailer.

- 0 The presence of twin trailers in the traffic stream influences the operation of other vehicles due to sight distance, speed and space requirements for passing.
- 0 Errors on the part of one operator can be compensated for by mature judgement and skill on the part of another driver in almost every situation.
- 0 Before and while driving, checking yourself out is as important as the pre trip inspection. Taking along any emotional baggage, i.e. personal problems, can lead to lack of concentration on driving, poor judgement and slow reaction to dangerous situations=
- 0 A safe driver always knows what's going on all around his vehicle. Use visual search techniques to get the big picture at least 12 to 15 seconds out from the vehicle. Keep your eyes moving scanning the horizon, looking back and forth between your mirrors and the road.
- 0 Include the instrument panel in your visual search to make sure your vehicle is operating properly and your speed is consistent with road, weather and traffic conditions*
- 0 Proper mirror adjustment is essential to seeing to the sides and rear of the vehicle. This procedure should be included in the pretrip inspection. Correct mirror adjustment allows for maximum visibility from the drivers position with minimum movement of the drivers head.
- 0 Most tractors are equipped with two kinds of mirrors, plane and convex. The convex mirrors show a wider area than the plane or flat mirror, but they make everything look smaller and farther away than they actually are.
- 0 Convex mirrors must be adjusted to show the areas that the plane or flat mirrors do not show. Convex mirrors should never be used to judge speed or distance of objects.
- 0 The plane or flat mirror should be used to see what is going on behind and to the side of the vehicle and to judge the distance and the speed of approaching vehicles.
- 0 The convex mirror is useful when checking for vehicles on entrance or exit ramps, when passing, and when making right turns. They are also helpful in partially eliminating blind spots on the sides of the vehicle. The other traffic has to move into a blind spot. Proper visual search will reduce the probability of someone entering your blind spots unnoticed.
- 0 A driver's first clue of a vehicle problem, trailer sway, off-tracking, tire failure, fire, etc., is usually via the rear view mirror. He / she should check mirrors quickly and frequently, looking back and forth between the mirrors and the road ahead.
- 0 A professional driver should increase mirror usage during maneuvers such as lane changes, turns, merges and heavy traffic.

- o Signalling what you intend to do is often the only way other drivers can know what you are going to do.
- o When making a turn (left or right) signal early well before you turn, signal continuously throughout the turn, and don't forget to cancel the turn signal after the completion of the turn.
- o When making a lane change put your turn signal on early, well in advance, to allow other motorists the opportunity to adjust for your maneuver or identify themselves to you if they are in a blind spot.
- o Use the four-way emergency flasher to communicate your presence when you are going very slow due to road conditions, weather conditions, a hazard ahead or are stopped.
- o When you are in the process of stopping for a hazard, railroad crossing, etc., warn other drivers by flashing your brake lights.
- o Use your horn only when it is necessary to identify your presence to another vehicle. Be aware that the sound of your horn could startle the other driver and could be dangerous. When faced with an emergency reaction state such as a vehicle suddenly encroaching in your path of travel, it is sometimes safer to allow the other vehicle to continue on its course or path of travel rather than risk a sudden braking on the part of the other startled person driving the vehicle.

MATERIALS

Classroom instruction must be supported by transparencies, wall charts, printed materials or individual class handouts to present information on how professional drivers interact with other traffic.

3.2 SPEED AND SPACE MANAGEMENT

Purpose

This unit provides instruction on the principles of speed and space management. Emphasis is placed on maintaining safe vehicular speed and appropriate space surrounding the vehicle under various traffic and road conditions. Special attention is placed on understanding the special situations encountered by twins in various traffic situations.

Outline of Suggested Content

☐ Speed management

- A. The importance of Speed management.
- B. Speed and stopping distance.
 - 1. Perception distance,
 - 2. Reaction distance.
 - 3. Braking distance.
- C. Vehicle weight and stopping distance.
 - 1. Total vehicle weight and traction.
 - 2. Weight distribution in each trailer.
 - 3. One of more empty trailers.
- D. Vehicle configuration, speed and shape of the road.
 - 1. Wind resistance and cross winds.
 - 2. Effect of gap between trailers and wind resistance.
 - 3. Road curves, grades, crowns.
 - 4. Lane widths, narrow bridges, and soft shoulders.
- E. Matching speed to road surface conditions.
 - 1. Traction and road surface friction.
 - 2. Slippery and icy road conditions.
 - 3. Hydroplaning, black ice.
 - 4. Shaded areas and bridge freeze first.

F. Speed and sight distance.

1. Sight distance and 12 to 15 second rule.
2. Effect of speed on field of vision.

G. Twins in the traffic flow.

1. How twins influence the traffic flow.
2. Speed Management in traffic.
3. Speed Management in merging situations.

H. Speed limits and speed management.

1. Speed limit may be too fast.
2. Problems encountered when safe is slower than the speed limit.

I. Effect of speeding on equipment and driver.

1. Accelerated deterioration of equipment.
2. Increased breakdowns.
3. Increased cost of operation per mile.
4. Driver fatigue and decreased response to road, hazards and environment.

☐ **Space management**

A. The importance of Space management

B. Space cushion around vehicle.

C. Space to the sides.

1. Positioning vehicle properly on road surface.
2. Adjusting within lane for various road conditions.
3. Positioning vehicle properly for various maneuvers.
 - a. Curves.
 - b. Exit & entrance ramps.
 - c. Lane changes.
 - d. Turns.

D. Space ahead of vehicle.

1. Following distance rule.
2. Affect on space behind vs. ahead.
3. Legal requirements for following distance.

E. Space behind vehicle.

1. Adjust for blind spot.
2. How to deal with tailgaters safely.

F. Space above and below the vehicle.

1. Overhead abutments, bridges, wires. etc.
2. Road hazards and debris.
3. Elevated railroad crossings and driveways.

G. Traffic gaps and merging situations.

1. Definition of gap in traffic.
2. Space and speed requirements when:
 - a. Crossing and entering traffic.
 - b. Passing.
 - c. Merging.
 - d. Railroad crossings.
3. Alignment with traffic when merging.
4. Six point procedure for merging into gaps.

H. Giving space to others.

1. Principles of right of way.
2. Avoid hindering traffic.
3. Adjust following distance to produce gap for others.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- 0 Judge the maximum safe speed at which a curve can be entered.
- 0 Judge the maximum safe speed that traction will permit.
- 0 Judge the maximum safe speed at which vehicle control can be maintained under crosswinds, limited visibility, and limited traction.
- 0 Adjust road speed of twins to the configuration and condition of the roadway.
- 0 Adjust road speed of twins to weather and visibility conditions.
- 0 Adjust road speed of twins to vehicle, cargo and driver conditions.
- 0 Adjust road speed and space around vehicle to accommodate other traffic.
- 0 Obey the legal speed limit.
- 0 Select the lane of travel which offers best mobility and least traffic interruption, in accordance with the law.
- 0 Establish a safe gap before changing lanes, passing other vehicles, and crossing or entering traffic.
- 0 Position the vehicle correctly in the lane of travel thereby minimizing hazards to other road users.
- 0 Position the tractor and trailers appropriately while initiating and completing various maneuvers such as curves, exit and entrance ramps, lane changes, and turns.
- 0 Maintain a following distance appropriate to traffic flow, road surface, weather, visibility and vehicle weight configuration.
- 0 Must be able to avoid road hazards, debris and overhead structures with inadequate clearance.

KNOWLEDGE OBJECTIVES

Driver must know:

- o The relationship of speed to stopping distance, hydroplaning, fuel economy and crash severity.
- o What effects the additional points of articulation (twins) will have on speed management.
- o What effects the additional points of articulation (twins) will have on the ability to maneuver.
- o How to minimize rear trailer sway or amplification, sometimes referred to as crack-the-whip effect.
- o The effect of vehicle weight distribution, center of gravity, vehicular stability, and road surface conditions on the maximum safe speed a set of twin trailer can travel.
- o The relationship between speed and sight distance.
- o The minimum safe following distance under various road, weather and traffic conditions, using the following basic rule: Allow one second of space for each 10 feet of vehicle length at speed below 40 mph. At speed above 40 mph add one second for safety.
- o That moving twins encounter more air resistance than singles, especially with crosswinds. This is attributable to both the second gap between the two trailers and to the increased overall length.
- o As vehicle speed increases, the angle decreases at which directional or lane changes can be made safely.
- o That speed adjustment is particularly critical on older roads built for smaller, slower vehicles.
- o State regulations concerning following distances, lane use, changing lanes, and passing other vehicles with twins.
- o The appropriate following distance for various load configurations and road, weather and traffic conditions.
- o The importance of maintaining maximum separation from other vehicles to ensure room to maneuver in response to hazards.
- o The importance of proper positioning of the vehicle in its path of travel in response to road, weather and traffic conditions.
- o The importance of timing acceleration and traffic gaps in order to manage space in traffic.
- o The dangers created by overhead obstructions.

SKILL OBJECTIVES

The driver must judge:

- o The maximum safe speed (twins) at which a curve can be entered; that traction will permit; and, at which vehicle control can be maintained under crosswinds, limited visibility, and limited traction.
- o The adequacy of gaps for passing, crossing and entering traffic, merging with traffic, and changing lanes.
- o The minimum safe following distance under various road, weather and traffic conditions, using the following basic rule: Allow one second of space for each 10 feet of vehicle length at speed below 40 mph. At speed above 40 mph add one second for safety.

ATTITUDE OBJECTIVES

The driver must believe:

- o Driving skill and experience (proficiency) cannot compensate for speed that is excessive for prevailing conditions.
- o There are situations where the speed limit may be too fast for road, weather and or traffic conditions.
- o That obeying the speed limit is beneficial to the driver, his employer and will reduce the risks of having an accident.
- o That courtesy on the highway is a good safety principle to follow.
- o That the ability to respond to changing road conditions requires proper speed and space Management techniques.
- o Maintaining maximum separation from other vehicles increases the opportunity to maneuver in response to hazards.
- o That maintaining a minimum safe following distance under various road, weather and traffic conditions is important.
- o That proper positioning of twins is important to accident prevention.
- o That it is the driver's responsibility to position the vehicle in such a way as not to impede other road users.
- o That intimidating other road users by not maintaining minimum safe following distance under prevailing road, weather and traffic conditions is illegal, unsafe, and detrimental to public relations.
- o When bobtailing, pulling an empty trailer(s) or pulling unstable or unevenly balanced loads, the basic formula for safe following distance needs to be increased.

Maior supporting concepts

- Driving too fast for road, weather and traffic conditions is a major cause of accidents. A professional driver must adjust his speed to prevailing driving conditions.
- There are three components to total stopping distance: **perception** distance, **reaction** distance, **braking** distance (includes "brake lag" and effective braking distance).
- Moving twins encounter more air resistance than single trailers. This is especially true with crosswinds, The effect is attributed to both the second gap between the two trailers and to the increased overall length.
- Drivers must believe that driving skill and experience (proficiency) cannot compensate for speed that is excessive for prevailing conditions,
- There are numerous conditions under which the legal speed limit may be unsafe for the prevailing road, traffic, and weather conditions.
- The driver must be able to judge the maximum safe speed (twins) at which a curve can be entered; that traction will permit; and, at which vehicle control can be maintained under crosswinds, limited visibility, and limited traction.
- As vehicle speed increases, the angle at which multiple trailer can safely execute directional changes decreases significantly. For example, a lane change at 15 mph could be made at a 45 degree angle while at 50 mph a significantly smaller angle would be required.
- Accurate speed adjustment is particularly critical on older roads built for cars of their day and frequently inappropriate for the characteristics of modern vehicles such as twins* Some examples of the problems are: numerous curves and hills; narrow lanes and bridges; low, narrow soft shoulders; many near road obstacles; changes in the number of lanes; poor or absent markings; and deteriorating edges, chuck holes, etc.
- Traction is friction between the tires and the road surface. Without traction you will lose steering and braking capacity. It will take longer to stop and it will be harder to turn when the road is slippery.
- The heavier the load on a trailer, the more work the brakes must do to stop the vehicle and the more heat they absorb. But, the trailer brakes, tires and suspension are designed to work best with a loaded trailer.
- Empty trailers require greater stopping distance than loaded trailers, because an empty trailer has less traction, It can bounce and lock up its wheels, giving much poorer braking.

- 0 Drivers must adjust their speed for curves in the road. If you take a curve too fast, the wheels can lose their traction creating a skid or the wheels may keep their traction and the vehicle rolls over. Tests have shown that trailers with a high center of gravity can roll over at the posted speed limit for a curve.
- 0 Braking in a curve is dangerous because it is easier to lock up the wheels and cause a skid or jackknife. Slow to a safe speed before you enter a curve and be in a gear and rpm range that will allow you to accelerate slightly or pull the trailers through the curve.
- 0 The principles of space management includes the concept of a space cushion around the vehicle. This is to encompass the space ahead, above and to the sides of the vehicle. Included is the concept of space for traffic gaps and giving space to others with whom we share the road.
- 0 Poor or bad driving behavior by either truck drivers or others operating in close proximity to the vehicle is especially risky. It places the vehicle close to the limits of its safe driving range, greatly reducing margins for even slight errors by either the truck driver or others operating nearby.
- 0 Some states require a minimum distance to be maintained between a multiple trailer combination and other vehicles except when overtaking or passing. By example the Colorado revised statutes require a minimum of six hundred feet (600) , except when overtaking and passing.
- 0 A safe driver always knows what's going on all around his vehicle and allows himself a space cushion or safety zone within which to operate his vehicle.
- 0 A safe rule for maintaining a minimum safe following distance is:
 - o Allow one (1) second for every 10 feet of vehicle length (or fraction thereof) for speed up to 40 mph.
 - o For speeds above 40 mph, add another second to the basic requirement.
 - o For bad weather, road conditions or poor visibility, add at least another second.
 - o Add one or more seconds when weather restricts visibility (i.e. rain, snow, fog)
 - o When highways are wet, add at least two (2) seconds.
 - o Add one (1) second for night driving.
 - o When following other trucks, extra space for sight distance is required.
 - o When bobtailing, pulling an empty trailer (s), pulling unstable or unevenly balanced loads or trailers, the following distance needs to be increased.

MATERIALS

Classroom instruction must be supported by materials presenting information on speed and accidents, including visuals that illustrate the effects of various factors on speed and space management.

3.3 NIGHT OPERATIONS

Purpose

This unit provides instruction on the principles of Night Operations. Emphasis is placed on the factors affecting operation of trucks at night. Night driving presents specific factors that require special attention on the part of the driver. Changes in vehicle safety inspection, vision, communications, speed and space management are needed to deal with the specific problems night driving presents.

Outline of Suggested Content

CI Night driving factors

A Driver factors.

1. Vision.
2. Glare.
3. Fatigue.
4. Driver experience.

B. Roadway factors.

1. Level of illumination.
2. Variations in level of illumination.
3. Familiarity with roads.
4. Other road users.
5. Alcohols and drugs on the road.

C. Vehicle factors

1. Headlights.
2. Auxiliary lights.
3. Turn signals.
4. Windshields.
5. Mirrors.

D. Conspicuity

1. Principle of conspicuity.
2. Levels of illumination.
3. Reflective markings*
4. Positioning of vehicle and visibility.
5. Turning maneuvers and visibility of vehicle.

☐ **Night driving procedures**

A. Preparation to drive at night=

1. Getting yourself ready.
2. Plan your route.
3. Getting your vehicle ready.
4. Vehicle Safety Inspection **at** night,

B. Driving at Night

1. Avoid blinding others.
2. Avoiding glare.
3. Maximizing visibility.
4. Adjusting basic driving techniques.

C. Speed and sight distance at night.

1. Sight distance and 12 to 15 second rule.
2. Effect of sight distance on perception and total stopping distance.
3. Effect of illumination on field of vision.
4. Speed limit may be too fast.
5. Problems encountered when safe is slower than the speed limit.

D. Space cushion around vehicle at night,

1. Space to the sides.
2. Space ahead of vehicle.
3. Affect on space behind vs. ahead.
4. Legal requirements for following distance.
5. Traffic gaps and merging situations.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- 0 Judge the maximum safe speed at which vehicle control can be maintained under various levels of illumination.
- 0 Adjust speed, following distance, and gap selection to nighttime conditions.
- 0 Judge when to use high beams on headlights when legally permitted.
- 0 Dim headlights, in accordance with state laws, to minimize interference with visibility of other drivers.
- 0 Respond safely to the glare of other vehicles by averting eyes and not retaliating.

KNOWLEDGE OBJECTIVES

Driver must know:

- o The effect of the level of illumination on ability to see (sight distance).
- 0 The relationship between speed, illumination and sight distance.
- o The appropriate following distance for various load configurations, road, weather and traffic conditions at night.
- o The importance of maintaining maximum separation from other vehicles to ensure room to maneuver in response to hazards at night.
- o The value of high beams to nighttime visibility.
- 0 State laws governing use of headlights and auxiliary lights.
- o The symptoms and dangers of fatigue.
- 0 The effect of headlight glare on visibility of others and its implication for the safety of both road users.
- 0 The general factors affecting night vision including interior illumination, ambient light and use of sunglasses during daytime.

SKILL OBJECTIVES

The driver must judge:

- Speed, distance, and separation between traffic under nighttime conditions.
- The adequacy of gaps for passing, crossing and entering traffic, merging with traffic, and changing lanes at night.

ATTITUDE OBJECTIVES

The driver must believe:

- The ability to see clearly diminishes at night.
- Driving skill and experience (proficiency) cannot compensate for speed that is excessive for levels of illumination and sight distance.
- There are situations where the speed limit may be too fast for levels of illuminations or sight distance.
- Maintaining maximum separation from other vehicles increases the opportunity to maneuver in response to hazards at night.
- That maintaining a minimum safe following distance under various levels of illumination is important.
- No one is immune to the effects of fatigue.
- That retaliating to other road users by using high beams is illegal, unsafe, and detrimental to public relations.

Major supporting concepts

- Driving too fast for level of illuminations (sight distance) is a major cause of accidents. A professional driver must adjust his speed to prevailing driving conditions.
- Drivers must believe that driving skill and experience (proficiency) cannot compensate for speed that is excessive for sight distance.
- There are numerous conditions under which the legal speed limit may be unsafe for the available illumination.
- The driver must be able to judge the maximum safe speed (of twins) under various levels of illumination.
- Braking in a curve is especially dangerous at night due to reduced sight distance. Slow to a safe speed before you enter a curve and be in a gear and rpm range that will allow you to accelerate slightly or pull the trailers through the curve.

- A safe rule for maintaining a minimum safe following distance at night is:
 - Allow one (1) second for every 10 feet of vehicle length (or fraction thereof) for speed up to 40 mph.
 - For speeds above 40 mph, add another second to the basic requirement.
 - For bad weather, road conditions or poor visibility, add at least another second.
 - Add one or more seconds when weather restricts visibility (i.e. rain, snow, fog)
 - When highways are wet, add at least two (2) seconds.
 - **Add one (1) second for night driving.**
 - When following other vehicles, extra space is required to reduce the likelihood of blinding other vehicles with your headlights.
- A safe driver always knows what's going on all around his vehicle and allows himself a space cushion or safety zone within which to operate his vehicle. Never overdrive your headlights.
- Keep speed within sight distance. Sight distance is limited to range of headlights. Speed must be lowered to reduce stopping distance. If speed exceeds sight distance, the driver is "overdriving" his headlights. Reduce speed as necessary to keep stopping distance within sight distance.
- Failure to adjust speed at night will result in not enough time and space to react to hazards.
 - Driver could lose control of vehicle if adjustment is too rapid.
- Clean lights and windshields are a must for safe night operation.
 - Dirty headlights can reduce illumination ahead up to 50 percent.
 - Even clean windshields cut out 5 percent of available light.
 - Just a few minutes of driving on wet roads can put enough dirt on your headlights to reduce their effectiveness by as much as 70 percent. The dirt acts as a filter, diffusing the light and reducing visibility.
 - A headlight out of line by even as little as one degree loses as much as 30 percent of its effectiveness.
- The average clean headlight provides only 300 feet of illumination ahead of the vehicle.
- Smoking constricts the blood vessels in the eye of a driver reducing his night vision capability.

- Poorly illuminated trailers can increase the risk of side underride collisions. Without special measures to increase its visibility at night, the trailers may not be reflected soon enough for the other vehicular driver to react.
- Increased conspicuity on the sides and rear of twin trailers may be a factor in reducing the probability of underride by smaller vehicles.
- Lighting of the second trailer is a safety factor. Driver should be careful to check lighting connectors and the intensity and cleanliness of lights and reflectors.
- Automobile drivers have a difficult time at night correctly perceiving the shape, road position, location, and speed of poorly illuminated trailers. This problem makes rear and/or side underride accidents even more likely.
- Given the increased length of the twin configuration, special effort is needed to increase the visibility of the sides and rear of the twin combination.

MATERIALS

Classroom instruction must be supported by materials presenting information on night driving procedures and the effects of various factors on sight distance and conspicuity. Include visuals demonstrating the effects of darkness and the consequences of improper night driving procedures.

3.4 EXTREME DRIVING CONDITIONS

Purpose

This unit provides instruction on driving twins under Extreme Driving Conditions. Emphasis is placed on the factors affecting operation of twins in cold, hot and stormy weather and in the mountains and the desert. Changes in basic driving habits are needed to deal with the specific problems presented by these Extreme Driving Conditions.

Outline of Suggested Content

☐ Cold weather operation

A. Vehicle safety inspection.

1. Pay special attention to coolant level and mixture, fuel mixture, heater, defroster, windshield wipers, washer fluid, brakes, fifth wheel, etc.
2. Tires, mud flaps and tire chains, condition, types, installation etc.
3. Cold weather starting procedures.
4. Road and weather condition hazards while doing VSI.
5. Freeing a stuck vehicle or frozen brakes.

B. Driving in cold weather.

1. Vehicle speed, weight and stopping distance under various road conditions.
2. Total vehicle weight and traction under various road conditions.
3. Weight distribution in each trailer.
4. One or more empty trailers.
5. Wind resistance and crosswinds under various road conditions.
6. Effect of gap between trailers under various road conditions.
7. Road curves grades and crowns under various road conditions.
8. Shaded areas and bridges freeze first.

CI Hot weather, desert conditions.

A. Vehicle safety inspection.

1. Pay special attention to coolant level and mixture, hoses, radiator, fuel mixture, air conditioner defroster, windshield wipers, windshield washer fluid, brakes, fifth wheel, etc.
2. Tires and brakes, condition, types, pressure etc.

B. Driving in desert conditions.

1. Procedures and hazards.
2. Effects upon vehicle operation.
3. Effects upon driver alertness.
4. Breakdown procedures.

☐ **Mountain driving.**

A. Gravity.

1. Total vehicle weight and speed control.
2. Weight distribution in each trailer.
3. One or more empty trailers.

B. Mountain pre-inspection.

C. Operating on upgrades.

D. Operating on downgrades.

E. Auxiliary braking devices (engine retarders).

F. Truck escape ramps.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES: Adverse Weather

Driver must be able to:

- Prepare for operation in cold weather including use and installation of tire chains when necessary.
- Inspect vehicle and prepare for cold weather operation by paying special attention to coolant level and mixture of anti-freeze, fuel mixture, moisture in air tanks, heater, defroster, windshield wipers, washer fluid, brakes, fifth wheel, etc.
- Check for ice accumulation on brakes, slack adjusters, air hoses, electrical wiring, etc.
- Judge the maximum safe speed at which vehicle control can be maintained under various weather and road conditions.
- Adjust speed, following distance, and gap selection to weather and road conditions.

KNOWLEDGE OBJECTIVES: Adverse Weather

Driver must know:

- The conditions that produce low traction and the effects of rain snow and ice on the ability to maneuver and/or stop twins.
- The relationship between vehicle speed, weight and stopping distance under adverse weather conditions.
- The causes and procedures for avoiding skidding, hydroplaning and jackknifing twins.
- The appropriate following distance for various twin load configurations, road, weather and traffic conditions under adverse weather conditions.
- The importance of maintaining maximum separation from other vehicles to ensure room to maneuver in response to hazards encountered under adverse weather conditions.
- How and where to mount and dismount tire chains on twins.

SKILL OBJECTIVES: Adverse Weather

The driver must:

- Adjust rate of change in speed (acceleration and deceleration) and direction of travel to road and weather conditions to maintain control of vehicle.
- Judge appropriate speed, distance, and separation between traffic under adverse weather conditions.

ATTITUDE OBJECTIVES: Adverse Weather

The driver must believe:

- That adverse weather conditions require special driving techniques and increased vigilance on the part of twin trailer drivers.
- Driving skill and experience (proficiency) cannot compensate for speed and directional changes that are excessive for weather and road conditions.
- There are situations where the speed limit may be too fast for road, weather and traffic conditions.
- Maintaining maximum separation from other vehicles increases the opportunity to maneuver in response to hazards .
- That it is especially important for drivers of twins to keep themselves informed of latest weather and road conditions.

PERFORMANCE OBJECTIVES: Hot Weather, Desert Conditions

Driver must be able to:

- Pay special attention to coolant level and mixture, hoses, radiator, fuel mixture, air conditioner, defroster, windshield wipers, windshield washer fluid, tires, brakes, fifth wheel, etc.
- Adjust driving habits to accommodate effects of desert heat.

KNOWLEDGE OBJECTIVES: Hot Weather, Desert Conditions

Driver must know:

- Procedures and hazards for hot weather, desert driving.
- The effects of hot weather driving on engine operating range, cooling system, fuel system, tires / tire pressure and the driver himself.

SKILL OBJECTIVES: Hot Weather, Desert Conditions

The driver must:

- Judge road direction and distance in the desert.

ATTITUDE OBJECTIVES: Hot Weather, Desert Conditions

The driver must believe:

- That hot weather can affect vehicle operation.
- That special precautions are required in inspecting trucks and preparing for hot weather / desert operation.
- That it is dangerous to leave a vehicle when it is disabled in the desert.

PERFORMANCE OBJECTIVES: Mountain Driving

Driver must be able to:

- Do a mountain pre-inspection and adjust brakes if necessary.
- Place transmission in appropriate gear while ascending and prior to descending grade.
- Use proper braking techniques while descending grade.

KNOWLEDGE OBJECTIVES: Mountain Driving

Driver must know:

- The effect of vehicle weight distribution and speed on downhill braking techniques.
- The function and value of escape ramps.

SKILL OBJECTIVES: Mountain Driving

The driver must:

- Utilize appropriate gear for descending grade.
- Operate braking system for maximum efficiency and safety.

ATTITUDE OBJECTIVES: Mountain Driving

The driver must believe:

- The proper gear and appropriate downhill braking technique is important to safely descend a mountain.
- That use of a truck escape ramp is safer than attempting to negotiate a downgrade when the vehicle is out of control.

Major supporting concepts

- Driving too fast for weather conditions is a major cause of accidents. A professional driver must adjust his speed to prevailing weather and road conditions.
- Drivers must believe that driving skill and experience (proficiency) cannot compensate for speed that is excessive for weather conditions.
- The driver must be able to judge the maximum safe speed (of twins) according to weather and road conditions.
- Braking in a curve is especially dangerous in adverse weather conditions. Slow to a safe speed before you enter a curve and be in a gear and rpm range that will allow you to accelerate slightly or pull the trailers through the curve.
- Failure to adjust speed to prevailing weather conditions will result in not enough time and space to react to hazards.
 - Driver could lose control of vehicle if adjustment is too rapid.
- Most existing five-axle twins have a significantly reduced ability to climb upgrades in adverse weather conditions versus tractors with two drive axles.

- Many mountainous states have specific requirements for chain use under varying weather conditions. In some western states, location requirements may vary among various highway districts. Here is a standard example of chain (wheel) location for an 18 wheel, 5-axle twin:
 - Drive axle inside and outside duals.
 - Front trailer Outside duals.
 - Converter gear Outside duals.
 - Rear trailer Rear axle outside duals.
 - The maximum speed limit with chains is 30 miles per hour unless posted.
 - Chains on drive axles improve pulling power going uphill. Chains on trailer wheels improve braking going downhill.
- A driver should be aware of his/her vehicle's and personal limitations. By doing this, a driver can recognize when conditions are too hazardous to drive.
- There are individual state permit authorities which limit the scope of operation of twins due to adverse weather.
- Moving twins encounter more air resistance than tractor-semitrailers, This is especially true with crosswinds. This effect is due to the overall length and to the second gap between the two trailers.
- The effect of side wind forces increases with the size of the vehicle. This increases the danger of sudden wind shifts in adverse weather* For twins, there is the danger of driving into a strong head wind and then suddenly turning or cornering. The head wind suddenly becomes a cross wind.

MATERIALS

Classroom instruction must be supported by materials presenting information on extreme driving conditions and procedures for operating in extreme conditions. Projected visuals, films or classroom models should be used to demonstrate the effects of slippery surface conditions on vehicle control. Dynamic visuals showing the effective use of escape ramps should be included.

3.5 PROFICIENCY DEVELOPMENT: SAFE OPERATING PRACTICES

Purpose

This unit provides drivers (trainees) an opportunity to refine, within the on-street traffic environment, their vehicle handling skills learned in sections one, two and three.

Driver performance will be closely monitored on progress towards the level of proficiency required for carrying out the basic traffic maneuvers of stopping, turning, merging, straight driving, curves, lane changing, passing, driving on hills, through traffic restrictions, at blind intersections and parking. The driver will also be assessed for regulatory compliance with all traffic laws.

Nearly all activity in this unit will take place on the public roadway in a full range of traffic environments. This is to include urban and rural uncontrolled roadways, expressways or freeways, under light, moderate and heavy traffic conditions. There is a brief classroom session to familiarize drivers with the type of on-street maneuvers they will perform and how their performance will be rated.

The instructor will assess level of skill development of the trainee and increase in difficulty the types of maneuvers, roadways and traffic conditions the driver trainee is exposed to based on his level of skill attainment.

Outline of Suggested Content

☐ Introduction to on-street proficiency development (Classroom)

- A. Description and purpose of on-street instruction.
 - 1. Safe operating procedures.
 - 2. Types of maneuvers on-street driving.
 - 3. Route planning.
- B. Procedures and practices.
 - 1. Safe operating procedures.
 - 2. Performance groups for on-street driving.
 - 3. Commentary driving techniques.
- C. Standards for performance evaluation.
 - 1. Vehicle control skills.
 - 2. Performance checks (criteria) for on-street driving.
- D. Safety rules for on-street driving.

☐ **Proficiency development: Safe operating practices**

A. On-street driving preparation.

1. Vehicle safety inspection.
2. Build (couple) twins.

B. Vehicle familiarization (low-density traffic conditions).

1. Starting, upshifting, downshifting and stopping.
2. Lane - keeping / straight.
3. Lane - keeping I curve.
4. Lane - keeping / turn.
5. Right turns
6. Left turns.
7. Driver trainee evaluation and feedback.

C. Practice in safe operating practices: On-street
(Instructor discretion as to route and amount of traffic)

1. Visual search techniques.
2. Communications techniques.
3. Speed management,
4. Space management.
5. Hazard perception and commentary driving.
6. Night driving.
7. Situations:
 - a. Various roadways based on skill attainment.
 - b. Controlled and uncontrolled interchanges.
 - c. Freeway interchanges.
 - d. Hills and grades.
 - e. Vehicle merges=
 - f. Traffic restriction areas.
 - g. Traffic control areas (stop sign or light controlled intersections).
 - h. Blind intersection.
 - i. Parking.

D. Basic vehicle operation evaluation

0 Trainee performance is evaluated against a prescribed criteria, including these basic control factors:

1. **Acceleration:** Smooth acceleration; no jerky, abrupt acceleration from a standing start and when increasing speed.
2. **Braking:** Smooth, controlled stops, no rebound of front end or sound of exhausting air.
3. **Stopping point:** Coming to a stop beyond a stop line or other designated stopping point.
4. **Upshifting:** Stalling, operating out of the designated RPM range; lugging; slipping the clutch; waiting too long to shift up; delayed shift between gears (losing too many RPM); missed shift (having to drop back into another gear); gear clash.
5. **Downshifting:** Allowing engine speed to exceed or fall short of designated RPM range; gear / engine mismatch resulting in lurch as clutch is released; delayed shift; over or under revving between gears; gear clash.
6. **Uphill operation:** Lugging (failure to shift soon enough); excessive loss of speed; roll back when starting from a standing point.
7. **Starting on an incline:** Improper coordination of parking brake, foot brake, and throttle resulting in one or more of the following: roll back; stalling engine; or excessive clutch slipping, particularly at high RPM.
8. **Downhill operation:** Starting down the hill in too high a gear; failing to maintain steady brake pressure.
9. **Speed adjustment/curves:** Excessive speed in entering turn or at an intersection, as indicated by: sharp lateral acceleration; braking while in a curve or turn.
10. **Lane-keeping/straight:** Touching or crossing lane marking when operating in a straight line.
11. **Lane-keeping/curve:** Wandering back and forth between lines or touching or crossing lane marking while in curve.
12. **Lane-keeping/turn:** Operating outside of the designated lane while in a turn.
13. **Right turn:** Right rear wheels cutting across curb or road edge; failing to check appropriate mirror before initiating turn; vehicle wanders while the applicant is checking mirror; failing to signal or fails to cancel signal.

14. **Left turn:** Beginning left turn too early; cutting across lanes approaching from left; failing to check appropriate mirror before initiating turn; vehicle wanders while the applicant is checking mirror; failing to signal or fails to cancel signal.
15. **Curves:** Wheels not kept within lane markings; failure to steer far left/right to compensate for the off-tracking of the trailers.
16. **Lane changing:** Failing to check appropriate mirror before initiating a lane change; vehicle wanders while the applicant is checking mirror; driver turns abruptly into adjacent lane; failing to signal or failing to cancel signal .
17. **Merging:** Failing to activate the turn signal in the direction of the intended merge before initiating merge; vehicle is not properly aligned to the roadway before a mirror check is made; failing to make a mirror check before initiating a merge,
18. **Traffic restrictions:** Clearly violating a traffic restriction i.e. using wrong lane, runs a yellow light, over the speed limit, failure to yield, driving across a solid delineator or zebra stripe, etc.
19. **Uncontrolled intersection:** Failing to look both ways prior to entering intersection; poor choice of speed / gear for conditions.
20. **Railroad crossing:** Failing to look both ways prior to railroad crossing; poor choice of speed / gear for conditions; shifting gears over railroad crossing.
21. **Blind intersection:** Failing to reduce speed prior to entering intersection; failing to look toward the blind intersection.
22. **Parking:** Failing to consider or plan exit; blocking other traffic; illegally or inappropriately parking; failing to set proper gear and parking brake and or blocking wheels.
23. **Right of way:** Proceeding on technical right of way when inappropriate, failing to yield right of way; crowding other vehicles; does not exercise due caution for pedestrians regardless of who has right of way.
24. **Following distance:** Failing to keep proper following distance; constantly changing following distance for no apparent reason,
25. **Vision management:** Failing to scan for hazards as evidenced by lack of eye and or head movement; unwillingness to use commentary driving techniques.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

○ No new objectives.

KNOWLEDGE OBJECTIVES

Driver must know:

○ No new objectives.

SKILL OBJECTIVES

Driver must:

○ No new objectives.

ATTITUDE OBJECTIVES

The driver must believe:

○ No new objectives.

This unit introduces no new instructional objectives. The in vehicle instruction provided for in this unit is intended to allow the driver trainee the opportunity to develop proficiencies relative to all prior instructional objectives to a level needed to pass the proficiency exam.

Major supporting concepts

- Basic control skills and maneuvers tests are used as an objective measuring device to determine when trainees have attained a sufficient degree of knowledge, skill and judgment of vehicle spatial requirements and self confidence necessary to commence the on-road training.
- Trainees should be provided practice in basic vehicle operation in low density traffic conditions before going on to more difficult on-road practice.
- Street routes must represent the broadest range of traffic situations to allow the driver trainee the opportunity to develop the skill necessary to operate safely and effectively on his own.
- In this unit, instructors should provide assistance to the trainees by:
 - Providing positive communications between the instructor and the trainee through the use of commentary driving techniques.
 - Accurately assessing the skill development of the trainee and exposing the trainee to the proper set of circumstances (road , traffic, etc.) to enable the learning process.
 - Warning them as to potential hazards, excessive speed, insufficient clearance and safety margins.
- To drive the vehicle in situations requiring sharp turning movements (particularly in tight quarters), on hills and in other situations requiring precise movements, twin trailer drivers need to coordinate use of vehicle controls and make skilled and properly timed actions based on sound judgements and decisions. Techniques and underlying concepts required for developing smoothness and precision in these maneuvers is an important part of the driver training curriculum.

-MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals portraying, from the driver's point of view, the hazards most commonly encountered by twin drivers. Also required are printed or visual materials that describe common hazards and the frequency with which they are encountered and materials that review commentary driving techniques.

On range instruction must be supported by materials or equipment that permit instructor and observer critique, such as:

- Observer checklist.
- Rules for on-street driving.
- Driver performance scoring criteria checklist or scoring forms.

UNIT 3.5 DRIVER RULES FOR ON-STREET DRIVING

- A. Operate vehicles only with the permission of the instructor and when an instructor is supervising you.
- B. Properly attach your lap / shoulder belt prior to putting the vehicle in motion.
- C. Follow all instructions given by the driving instructor. If you do not understand an instruction, ask for clarification before proceeding.
- D. Alert the driving instructor to any malfunction or potential malfunctions indicated by gauges, warning lights, etc.
- E. Obey all traffic laws.
- F. Carry your drivers license or learners permit, medical certificate, and logbook at all times.
- G. No trainee may drive after drinking any alcoholic beverage or when he / she is taking prescribed drugs or other medication that may affect his/her ability to drive safely.
- H. Check your path carefully before moving.
- I. Trainees in the vehicle who are not driving, must be observing the driver and the road ahead. They may not carry on conversations that will distract the driver.

SECTION 4 - Advanced Operations

The units in this section introduce higher level skills that can be acquired only after the more fundamental skills and knowledge taught in sections two and three have been mastered. The purpose of this section is to teach the perceptual skills necessary to recognize potential hazards and to demonstrate the procedures needed to handle a twin combination vehicle when faced with a hazard.

Unit 4.3 of this section provides instruction on how to keep the vehicle in safe and efficient operating condition. the purpose of this unit is to teach how to perform simple maintenance tasks and how to troubleshoot and report those activities that must be performed by a qualified mechanic.

Three units comprise this section:

UNIT: SUGGESTED CLOCK HOURS OF INSTRUCTION

UNIT		CLASS- ROOM	LAB	RANGE	STREET	TOTAL
4.1	Hazard Perception	4			2	6
4.2	Hazardous Situations	3				3
4.3	Maintenance and Troubleshooting	4	4			8
TOTAL		11	4	0	2	17

4.1 HAZARD PERCEPTION

Purpose

This unit provides instruction on the principles of recognizing hazards in sufficient time to reduce the severity of the hazard and neutralize a possible emergency situation. While hazards are present in all motor vehicle traffic operations, some are peculiar to twin trailer combinations. Emphasis is placed on hazard recognition, visual search, and response to possible emergency producing situations encountered by twins in various traffic situations.

Outline of Suggested Content

☐ Importance of hazard recognition

- A Definition of a hazard.
- B. Role of visual search in hazard perception.
- C. Methods used in hazard perception.
- D. Sources of clues / where to look.

CI Road characteristics

- A Nature of problems encountered.
- B. Surface conditions due to weather debris or construction.
- C. Shape and contour of the road.
 - 1. Tight curves with insufficient superelevation.
 - 2. Hazardous sequence of curves.
 - 3. Short deceleration lanes.
 - 4. Curb placement on curves.
 - 5. Ramp downgrades leading to tight curves.
 - 6. Off-tracking of twins.
 - 7. Speed advisory signs for curves / ramps appropriate for cars not trucks.
- D. Visibility restrictions.
- E. Crosswinds.

- **I Road user characteristics**

- A. Drivers with obstructed vision .
- B. Distracted or confused drivers.
- C. Slow moving vehicles.
- D. Impatient or impaired drivers.

- ☐ **Road user activities**

- A. Driver or vehicle movement.
- B. Emergency areas and pedestrians/cyclists.
- C. Conflicts.

- ☐ **Characteristics of twins.**

- A. Definition of sensory feedback.
- B. Twin trailer combinations have additional points of articulation and therefore require additional vigilance and skills.
- C. Effect of second coupling point on sensory feedback.
- D. Effect of gap between trailers under various road and traffic conditions.
- E. Effect of weight distribution in each trailer.
- F. Effect of isolation from trailing or second unit with single pintle hook couplings.
- G. Reduced ability to sense impending trailer instability i.e. sliding, rollover, or bounce=
- H. Wind resistance and crosswinds under various road configurations.
- I. Development of special kinesthetic, body "feel" or sense for the trailing unit and the dynamic forces acting on it.
- J. Rule mirrors play in identifying hazardous situations.

- ☐ **Commentary driving techniques**

- A. Definition and rule in safety education=
- B. Hazard identification.
- C. Hazard description.
- D. Search, Identify, Predict, Decide, Execute (SIPDE) concepts.
- E. Examples of commentary driving techniques*

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Identify (using Commentary Driving techniques) road conditions and road users that pose a potential threat to the safety of the twin trailer driver.
- Adjust road speed and space around vehicle to reduce the potential threat posed by either road conditions or other road users.
- Adjust visual search pattern to compensate for the potential threat posed by either road conditions or other road users.
- Monitor trailers and identify signs of impending hazardous situations.
- Develop a special kinesthetic sense or body "feel" for the trailing unit, through experience, vigilance and appropriate mirror usage.

KNOWLEDGE OBJECTIVES

Driver must know:

- The visible characteristics of road conditions that present a hazard to safe operation. This is to include slippery, soft, sloping, or uneven surfaces, debris, dangerous curves, obstruction to visibility, and locations where there are likely to be strong crosswinds.
- The characteristics of other road users (drivers or pedestrians) that make them potentially dangerous. This is to include obstructed vision, distraction, confusion, impatience, impairment, and low speeds.
- What activities of other road users are capable of providing clues to potential danger. This is to include head and body movement, vehicle movement, and emergency or conflicting situations.
- How to compensate for the lack of understanding of others with whom we share the road.
- That the presence of twin trailers in the traffic stream influences the operation of other vehicles.
- How to develop a sense for the changing dynamic forces acting on the trailers.
- The effect of delayed trailer response to driver steering.
- How to compensate for the increased number of coupling points and resulting impaired sensory feedback when driving twin trailers.

SKILL OBJECTIVES

THE DRIVER MUST:

- Perceive immediately a potential threat by the visible characteristics and actions of other road users and initiate prompt defensive or evasive action
- Perceive immediately a potential threat by the visible characteristics of road conditions and initiate prompt defensive or evasive action.
- Focus on developing a special kinesthetic or body "feel" or sense for the twin trailing unit.

ATTITUDE OBJECTIVES

The driver must believe:

- That twin trailer combinations have additional points of articulation and therefore require additional vigilance and skills.
- That the ability to respond to changing road conditions requires constant vigilance and attention.
- That most hazards can be detected in time to avoid a collision.
- That serious hazards are encountered frequently enough to require constant attention to changes in the environment.
- That any delay in responding to a perceived hazard can result in an accident.
- That a professional driver has a moral obligation to himself and the motoring public to do the best he / she can do.
- Professional drivers must compensate for the lack of understanding of others with whom we share the road.

Major supporting concepts

- While hazards are present in all motor vehicle traffic operation, there are special hazards peculiar to twin trailer combinations.
- Hazard recognition training will help drivers recognize dangerous situations (hazards) before they become emergencies. Good visual search habits will help ensure that drivers see emergency producing situations before they become real emergencies.
- A hazard is any road condition or other road user that presents a potential danger to safety of operation. Drivers must recognize the potential dangers in the driving environment in order to respond to them before they become emergencies, There are many clues provided by other road users that spell danger.

- 0 Drivers must believe that most hazards can be detected in time to avoid a collision. Serious hazards are encountered frequently enough to require constant attention on the part of the driver. Any delay in responding to a perceived hazardous situation can result in an accident.
- Errors on the part of one operator can be compensated for by mature judgement and skill on the part of another driver in almost every situation.
- Expressway ramps are particularly hazardous to trucks. The design standards for these ramps are based almost exclusively on passenger car dimensions.
- 0 Certain ramp design parameters make it all too easy for a truck driver to lose control of his vehicle. A truck entering a curving highway entrance or exit ramp at high speed must slow down rapidly on a curving roadway, placing a truck at immediate risk for a jackknife or rollover accident. Compound curves, where the degree of curvature varies throughout the curve, presents a particularly difficult challenge. Speed advisory signs compound the problem by giving speeds appropriate for cars not trucks.
- The following are a series of ramp situations identified by University of Michigan Transportation Research Institute (UMTRI) where the driver may face difficult control and/or handling challenges:
 - Tight curve with insufficient superelevation. Superelevation means the degree of banking -- the raising of the outside of the lane surface, relative to the middle.
 - Hazardous sequence of curves. This situation, with only one posted ramp speed contains four curves, each with a different radius. Some ramps have a flatter curve between two sharper curves.
 - Short deceleration lane leading to a tight radius curve. The entrance to this exit ramp can produce both rollover and jackknife accidents.
 - Curb placed along outside of curve. Rollover may result when off-tracking rear wheels of rear trailer trip on the outside curb of the curved ramp.
 - Ramp downgrade leading to a tight curve. Ramps having a downgrade leading to a final demanding curve also pose a special problem for loaded trucks.
- A driver's first clue of a vehicle problem, trailer sway, off-tracking, tire failure, fire, etc., is usually via the rear view mirror. He / she should check mirrors quickly and frequently, looking back and forth between the mirrors and the road ahead.

- A North Carolina study states that hazards to twins can be created by the highway itself including:
 - Pavement edge drops can cause special hazards for the second trailer. For example, a rear trailer tire dropping off the edge can lead to swaying.
 - Road irregularities (bumps, joints, pavement lapovers, rough surfaces, potholes etc.) affect twins because they can cause the second trailer to sway.
 - Poor signing can fail to alert the driver of upcoming lane detours or path changes. An abrupt change can lead to instability in the second trailer.
- Proper choice of speed is a major tool to be used in coping with highway hazards. As speed increases the time available for searching, identifying, predicting, deciding and executing decreases.
- An edge drop-off of 24 inches or more will cause a rollover. Some twin combinations may experience rollover on an edge drop-off of as little as 12 inches
- Because of the greater number and flexibility of trailer couplings in twins, their drivers are less able to sense impending trailer instability.
- Drivers of twins must develop a special kinesthetic or body "feel" or sense for the trailing units. Much of this feel is developed through experience.
- Drivers of twins are somewhat isolated from their trailing unit. The increased number of articulation points and the use of single pintle-hook couplings reduces the ability of the driver to "sense" impending sliding, rollover, or even bouncing of the trailing unit. This impaired sensory feedback must be compensated for by increased mirror usage.

MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals portraying, from the driver's point of view, the hazards most commonly encountered by twin drivers. Also required are printed or visual materials that describe common hazards and the frequency with which they are encountered and materials that review commentary driving techniques.

On-street instruction must be supported by materials or equipment that permit instructor and observer critique, such as an observer checklist.

4.2 HAZARDOUS SITUATIONS

Purpose

This unit provides classroom discussion on dealing with specific procedures, appropriate to twin-trailer emergencies. These include evasive steering, emergency braking, off-road recovery, brake failures, tire blowouts, rearward amplification, hydroplaning, skidding, jackknifing and the rollover phenomenon. The discussion will include a review of unsafe acts and the role they play in producing hazardous situations. Emphasis is placed on operating practices likely to reduce the severity of the hazardous situation and responses to emergency situations.

Outline of Suggested Content

☐ **Hazardous situations**

- A. Definition.
- B. Nature of problems encountered.
- C. Role of safe operating practices.
- D. Review of unsafe acts.
- E. Reducing the severity of the hazardous situation.

CI Emergency maneuvers

- A. Role of emergency maneuvers.
 - 1. Evasive steering.
 - 2. Emergency stop.
 - 3. Off-road recovery.
 - 4. Brake failure.
 - 5. Blowouts.

☐ **Skid dynamics**

- A. Stage of traction.
 - 1. Static traction.
 - 2. Rolling traction.
 - 3. Sliding traction.
- B. Wheel load.
- C. Forces of motion.

D. Four basic causes of skids.

1. Braking.
2. Accelerating.
3. Change in direction.
4. Hydroplaning.

E. Preventing skids.

☐ **Types of skids twins can experience**

A. Steering wheel skid.

B. Tractor drive axle (rear wheel skid).

C. Trailer skid.

1. Single.
2. Multiple.

D. All wheel skid.

E. Power skids.

F. Spin-out.

G. Hydroplaning.

H. Summary of skid prevention.

☐ **Skid recovery**

A. Speed control.

B. Steering characteristics.

1. Oversteering.
2. Understeering.
3. Neutral steering.

C. Corrective steering.

D. Countersteering.

E. Braking to stop-

☐ **Rollover**

- A Definition.
- B. Rearward amplification.
- C. Trailer sway.
- D. Rollover threshold.
 - 1. Speed and direction.
 - 2. Condition of roads, curves, ramps and superelevations.
 - 3. Weight of cargo and height of vehicle's center of gravity.
 - 4. Bulk liquids and surge.
 - 5. Motion and visual cues.
 - 6. Prevention using safe driving practices.

CI Unsafe driving acts

- A Definition.
- B. Behavioral factors must frequently reported.
- C. Prevention using safe driving practices.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- identify road conditions and road users that are a potential threat to the safety of himself and other road users.

KNOWLEDGE T I V E S

Driver must know how to:

- 0 Incorporate safe operating practices into daily driving habits.
- Bring the twins to a stop in the shortest possible distance while maintaining directional control of the twins on dry pavement,
- 0 Bring the twins to a stop in the shortest possible distance while maintaining directional control of the twins on slippery pavement'
- Perform a "quick" evasive turn on a dry surface .
- Make an evasive turn off the roadway and return to the roadway while maintaining directional control of the vehicle.
- Maintain directional control while operating over a slippery surface.
- Recover from tractor or trailer (s) skids induced by slippery surfaces.
- 0 Correct for vehicle's steering characteristics.

Driver must know:

- o The principle unsafe driving acts or behaviors that contribute to or cause the majority of motor vehicle crashes.
- o The rule safe operating practices play in reducing the severity of hazardous situations.
- o That the vehicle can generally be turned more quickly than it can be stopped.
- o That in an impending head-on collision, it is generally safer to leave the roadway than to strike another vehicle.
- o The procedures for quick stops, quick turns, and evasive turns off the roadway.
- o The procedures for handling brake failures and tire blowouts.
- o The procedures for reducing the effects of rearward amplification of the rear trailer.
- o The procedures for minimizing the possibility of rollover.
- o The causes of skids.
- o The best prevention for skidding is to control speed and adjust driving habits to weather, road, and traffic conditions.
- o The principles of skid dynamics, friction, wheel load, fidelity (tracking), force and rearward amplification.
- o The characteristics of a tractor or trailer (s) jackknife, steer axle skid, all wheel skid, hydroplaning and rollover.
- o Skid control and recovery procedures,

SKILL OBJECTIVES

THE DRIVER MUST:

- Recognize a potential threat by the visible characteristics and or actions of the threat and initiate prompt defensive actions.

ATTITUDE OBJECTIVES

The driver must believe:

- That unsafe driving acts or behaviors cause or contribute to motor vehicle crashes.
- That it is safer to leave the road than to risk a head-on collision with another road user.
- A driver should never give up efforts to cope with an emergency.
- That most skids are preventable.
- That skids can occur at any speed.
- That it is possible to recover from skids if they are detected and corrected promptly.

Major supporting concepts

- While hazards are present in all motor vehicle traffic operation, there are special hazards peculiar to twin trailer combinations.
- A hazard is any road condition or other road user that presents a potential danger to safety of operation. Drivers must recognize the potential dangers in the driving environment in order to respond to them before they become emergencies. There are many clues provided by other road users that spell danger.
- An emergency arises when one or more drivers fail to employ safe driving practices, such as those depicted in : vehicle Inspection, visual search, hazard recognition, communications, speed and space management, night operations, and extreme driving conditions.
- Safe operating practices will not always prevent emergencies. No one is perfect; mistakes are bound to create emergencies. It is therefore critical that drivers know how to handle emergencies when they arise.
- The emergency maneuver and procedures defined for semi tractor trailer operation may not be appropriate for twin trailer operations. Specific procedures, appropriate to twin-trailer emergencies, need to be defined and taught to twin-trailer drivers.

- The tires of lightly loaded twins can experience hydroplaning when the footprint of the tires on the road surface is incapable of expelling water between the tire and the road surface. Research indicates that empty twins can hydroplane at speeds of 55 to 58 mph.
- Hydroplaning can occur at the steer tires of tractors when excess weight on the rear axle (s) lightens the front end.
- Additional trailers, can increase the potential for jackknife conditions since they add additional axles, piping and valves.
- Jackknifing accidents can occur at a ramp location when the truck driver overbrakes to avoid rollover. The overbraking causes the tractor's drive axles to lock up, and that causes the tractor to revolve (yaw) rapidly. If the driver releases the brakes before the tractor has rotated through more than a modest angle, all of the tractor tires recover their rolling state, and this propels the vehicle to the inside of the curve.
- The engine retarder is a very unbalanced brake system. It can lockup the drive axle on a slippery surface, precipitating a tractor jackknife.
- When lockup occurs on the wheels of the steering axle, the vehicle is unsteerable and cannot be directed along a curved path or around an obstacle* When lockup occurs on the wheels of the tractor's rear axle or on the wheels of a dolly's axle, the tractor or dolly is unstable in yaw resulting in a jackknife. Finally, if the wheels of the rearmost trailer lockup, that end of the trailer swings outward in a trailer swing or jackknife.
- When twins are steered through an abrupt maneuver such as a sudden lane change, the rear trailer may exhibit an exaggerated side-to-side motion often described as the "crack-the-whip" effect. This phenomenon is known technically as rearward amplification and may result in rollover of the rear trailer.
- Rearward amplification is a characteristic of multiple trailer combinations where the lateral acceleration of the tractor is amplified rearward to the point where the rear trailer could possibly roll over. Twins have an amplification of 2.0, which means the rear trailer experiences twice the lateral acceleration of the tractor. This can result in the driver making an evasive maneuver that feels safe in the tractor, but that can cause the rear trailer to roll over.
- The last trailer of a twin trailer combination with 27 foot trailers is two times more apt to roll over in a sharp turn than a five axle semi-trailer with a 45 foot trailer.
- A driver of twins may be able to steer the tractor around an immediate obstacle without approaching the rollover limits of the tractor, but the trailing units may swing out of the path of the tractor -- in a "crack the whip" fashion -- thereby going off the road or into an adjacent lane and/or rolling over due to the high lateral acceleration generated during the "correction phase" of the maneuver.

- o The height, position and type of cargo are important factors in determining the likelihood of a rollover.
- o In a tank vehicle with bulk liquids, sudden steering movements or braking applications can cause product surge and shifting of the vehicle's center of gravity. This in turn contributes to the likelihood of a rollover.
- o Rollover accidents are disproportionately more prevalent on curved roads. Other vehicle factors, such as component part failures or deficiencies and shifting loads, are over represented in this type of accident.
- o Rollover accidents are a major source of truck driver fatalities.
- o Unsafe driving acts (UDA) are defined as driving behaviors that cause or contribute to motor vehicle crashes. A relative risk analysis fur twins would help establish more accurate priorities regarding what behaviors should be targeted for change. Though, it would appear that speed, failure to yield and following too closely are behaviors that warrant change.

MATERIALS

Classroom instruction must be supported by dynamic visuals or sequential static visuals portraying, from the driver's point of view, the hazardous situations most commonly encountered by twin drivers. Printed or visual materials that describe unsafe driving acts (UDA) and the frequency with which they are encountered should be used for discussion purposes. Materials presenting information on physical principles, skid control and recovery procedures and rollovers should also be used.

4.3 MAINTENANCE AND TROUBLESHOOTING

Purpose

This unit introduces drivers to the basic servicing and checking procedures for the various vehicle components and to help develop their ability to 1) perform preventive maintenance, 2) make simple emergency repairs, and 3) diagnose and report vehicle malfunctions.

Outline of Suggested Content

- ☐ **Nature and importance of preventive maintenance**
 - A. Overview of Maintenance.
 - 1. Fleet performed maintenance.
 - 2. Driver performed maintenance.
 - B. Type of maintenance.
 - 1. Routine servicing.
 - 2. Scheduled preventive maintenance.
 - 3. Unscheduled maintenance.
 - C. FMCSR inspection and maintenance requirements.
 - D. Importance of preventive maintenance.
- ☐ **Performing basic servicing and routine maintenance**
 - A. Checking and changing engine fluids and filters.
 - B. Inspecting and changing lights and fuses.
 - C. Checking tire air pressure.
 - D. Changing tire in a roadside emergency.
 - E. Draining moisture from air reservoir and fuel system.
 - F. Roadside (emergency) adjustment of brakes.
- ☐ **Diagnosing and reporting vehicle trouble**
 - A. Importance of troubleshooting and reporting.
 - B. Troubleshooting.
 - C. Reporting Requirements.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Check and service engine fuel, oil, coolant, battery, and filters involved.
- Perform simple repairs to enable a vehicle to reach a maintenance facility.
- Check tire air pressure.
- Change wheels (with tires mounted) and check for proper tire and wheel mounting.
- Drain moisture from air brake supply reservoirs and fuel system.
- Check brakes and make roadside (emergency) adjustment of brakes.
- Clean and repair lights.
- Change fuses and reset circuit breakers.
- Identify vehicle systems or components that are functioning properly, but are in imminent danger of failing, or functioning improperly.
- Describe symptoms of improper operation completely and accurately to maintenance personnel.

Driver must:

- Avoid performing maintenance for which they are not qualified.
- Properly report breakdown occurring enroute.

KNOWLEDGE OBJECTIVES

Driver must know:

- The procedures for performing inspections and authorized maintenance and repairs.
- Enough to avoid attempting repairs for which they are unqualified.
- The importance of periodic inspection and repair to prevention of enroute breakdowns, long life of parts, safety, and economy of operation.
- The inspection, repair and maintenance requirements of the Federal Motor Carrier Safety Regulations.
- The symptoms of improper operation revealed through instruments and sight, sound, feel, smell, and vehicle operation characteristics.
- The danger of exceeding maintenance restrictions imposed by the employer or the driver's skill limitations.

SKILL OBJECTIVES

Driver must:

- o None.

ATTITUDE OBJECTIVES

The driver must believe:

- o Preventive maintenance and repair will prevent enroute breakdowns and ensure long life of parts, safety, and economy of operation.
- o It is the driver's responsibility to assure that the vehicle is in safe, economical, operating condition.
- o Drivers and mechanics must work together as a team to achieve safe, economic operation for maximum job security for all employees.

Major supporting concepts

- o Drivers may not be able to repair their own vehicles but they should be able to make routine safety checks, perform routine maintenance checks and servicing, and spot signs of equipment trouble.
- o Keeping a twin-trailer rig in good maintenance and repair can help prevent breakdowns and crashes, (On road breakdowns frequently result in accidents).
- o Letting a vehicle deteriorate can lead to poor performance; breakdowns on the road; accidents; excessive repair costs; less fuel mileage per gallon; and traffic violations or being placed out-of-service at roadside inspections.
- o Since instruments, gauges and other signs cannot warn of all trouble in advance, and since changes in vehicle performance occur so gradually the driver fails to recognize them, preventive maintenance is important. For example, brakes wear out so gradually that the driver is hardly aware of it.
- o Preventive maintenance is checking and correcting a vehicle's condition so as to catch any signs of wear or damage before they cause real trouble.
- o In some fleets, drivers are required to perform basic or routine maintenance and servicing tasks as part of their jobs. Likewise, some motor carriers prohibit their drivers from performing some of these tasks.
- o It costs more to repair or replace a neglected part than to perform preventive maintenance.

- There is no excuse for operating a vehicle with safety defects or operating it in such a way as to cause premature wear and tear to components.
- Why should a driver learn about the contents of this unit if the driver may be employed by a fleet that has a policy of not allowing drivers to do any servicing and / or adjustments to vehicles? A few good reasons are:
 - If a mechanic is adjusting the brakes and is doing it carelessly, the driver better be able to recognize the error or risk being involved in an accident.
 - If the driver's rig has a breakdown late at night and it is 10 below zero outside and it is 15 miles to the nearest telephone, the driver will be glad to have some basic mechanical knowledge.
- Drivers should be trained and conversant in FMCSR sec. 396.25 Qualification of Brake Inspectors. Note that a driver who has a CDL air brake endorsement is considered qualified to inspect but not necessarily adjust the trailer or tractor brakes.
- Drivers aren't expected to become expert mechanics, but they should be able to identify the exact sources of malfunctions. Drivers must be able to identify and report symptoms accurately enough so that mechanics are able to perform the necessary diagnosis (shop) and / or to come to the site of the road breakdown with the necessary tools and parts to repair the problem.
- Detecting, diagnosing, and reporting vehicle malfunctions is the driver's primary troubleshooting role. Driver should not attempt to fix problems he / she is not fully qualified to handle.
- A vehicle will, in most cases, warn the driver of impending trouble by giving off warning signals. These warning signals come in several different forms. The driver should have a working knowledge of the common warning signals.
- The better the driver understands how vehicles work, the easier it will be to recognize the first signs of trouble and describe them accurately to a mechanic so that the mechanic can track down the difficulty and correct it.

MATERIALS

The following checklists contain suggested procedures and serve as a guide for instructional purposes. These checklists are to serve as examples and are not to be considered as inclusive. Items included are:

1. Checking Fuel Tank, Fuel Level and Changing Fuel Filters Checklist.
2. Checking Oil Level and Changing Oil Filters Checklist.
3. Checking Coolant Level and Changing Coolant Filters Checklist.
4. Checking Battery and Power Steering Fluid Level Checklist.
5. Changing Air Filter Elements Checklist.
6. Changing Head Lamp, Fuses and Resetting Circuit Breakers Checklist.
7. Draining Moisture from Air and Fuel System Checklist=
8. Adjusting Brakes Checklist*
9. Checking Tire Air Pressure and Checklist.
10. Procedures fur Jump Starting Dead Batteries.
11. Procedures for Starting Vehicle with Air Starter--No Air Pressure.
12. Hints fur Drivers in diagnosing Vehicle Trouble.

UNIT 4.3 CHECKLIST NUMBER 1 (PG. 1 OF 2)

CHECKING FUEL TANK, FUEL LEVEL & CHANGING FUEL FILTERS

Fuel Tanks

1. Open drain cocks on bottom of tanks and drain off any water present.
2. Tighten all fuel tank mountings and brackets.
3. Check seal in fuel tank cap and check breather hole.

Fuel Level

1. Park vehicle on level ground.
2. Open fuel tank cap.
3. Visually check fuel level.
4. Make sure level corresponds with gauge reading in cab.

ChanainaFilters StrainerReplacement

1. Turn fuel filter element counter clockwise until it is free of base.
2. Discard filter element.
3. Clean seal surface on filter base.
4. Wipe up fuel that was spilled during filter removal.
5. Coat seal of new filter with clean diesel fuel or engine oil.
6. Thread filter onto base until seal contacts base.
7. Tighten filter an additional 1/2 turn.
8. Start engine and check for leaks.

UNIT 4.3 CHECKLIST NUMBER 1 (PG. 2 OF 2)

CHECKING FUEL TANK, FUEL LEVEL & CHANGING FUEL FILTERS

Changing Filters Filter Replacemen

1. Turn off fuel supply from fuel tanks.
2. Place a suitable container under filter.
3. Open drain cock in filter housing base and drain.
4. Remove filter body (with element).
5. Discard filter element.
6. Clean housing and close drain cock.
7. Install new filter in housing.
8. Fill housing with clean fuel.
9. Install filter housing (containing new filter element) with a new gasket (lubricate with fuel or engine oil) and tighten.
10. Open fuel line shut off valve.
11. Start engine.
12. Check for leaks.

UNIT 4.3 CHECKLIST NUMBER 2

CHECKING ENGINE OIL LEVEL AND CHANGING OIL FILTERS

Oil Level

1. Park vehicle on level ground, shut engine off and allow a few minutes for oil to drain down before checking.
2. Locate dipstick.
3. Pull stick out, wipe clean and replace.
4. Pull out again to check oil level.
5. Level should be maintained between the full and add marks.
(Do not overfill or operate vehicle when oil level is below add mark).

Change Oil Filter

1. Remove drain plug from bottom of filter housing, drain oil.
2. Remove filter housing containing filter element (consult manufacturer's owner's guide for specific instructions on removal of filter elements).
3. Discard filter.
4. Clean housing and cover.
5. Replace with new filter element, secure housing.
6. Replace drain plug.
7. Start engine, check for leaks.
8. Shut engine down, wait 10 minutes.
9. Check oil level (add sufficient oil to bring it to proper level on dip stick).

UNIT 4.3 CHECKLIST NUMBER 3

CHECKING COOLANT LEVEL AND CHANGING COOLANT FILTERS

Coolant Level

A. Preparation

1. Shut engine off (never check when running).
2. Wait until engine has cooled.
3. Even then use extreme care when removing radiator cap.
4. Protect hands (gloves, thick cloth).

B. Removing Radiator Cap

1. Turn cap slowly to the first stop.
2. Step back while pressure is released from cooling system.
3. When all pressure has been released, press down on the cap and remove it.

C. Checking Coolant Level

1. Visually check level of coolant, add if necessary (consult operator's manual for specific instruction for your particular vehicle).
2. Some vehicles have sight glasses or see through overflow containers for checking coolant level.

Chanaina Coolant Filters

A. Preparation

1. Shut engine off.
2. Wait until engine has cooled.
3. Do not handle hot filter with bare hands (gloves, thick cloth).

B. Removing Filter

1. Turn filter element counter clockwise and remove.
2. Replace with new filter element and new cover gasket.
3. Start engine, check for leaks.

UNIT 4.3 CHECKLIST NUMBER 4

CHECKING BATTERY FLUID LEVEL

Precautions

1. Caution: Batteries contain acid which will cause severe burns if contacted with skin.
2. Batteries give off explosive gases--no **smoking**.
3. Protect eyes with goggles or glasses.

Checking Fluid Level

1. Open battery caps, check fluid level (not necessary with maintenance free batteries)
2. Fill if needed--bring level to bottom of split ring in cell filler well. (Add distilled water if possible, never use acid).

PROCEDURE FOR CHECKING. POWER STEERING FLUID LEVEL

Preparation

1. With engine running at normal operating temperature, turn steering wheel back and forth several times to stabilize fluid level.

Checking Fluid Level

1. Stop engine.
2. Remove dipstick.
3. Fluid should register between bottom of dipstick and full mark.
4. Add if necessary, bring level to full mark, do not overfill (Consult manufacturer's specification in owner's manual for correct type of fluid).

UNIT 4.3 CHECKLIST NUMBER 5

CHANGING AIR FILTER ELEMENTS - DRY AIR CLEANERS

On air cleaners with a restrictions indicator, change or clean element when indicator shows red.

On vehicles equipped with an air filter restriction gauge, replace element when gauge reads 25" for Cummins and Caterpillar engines and 20" for Detroit Diesel engines.

Steps

1. Remove end covering from housing.
2. Remove filter element (do not handle with greasy hands).
3. Inspect end cover and gasket surfaces for dents or possible air leaks.
4. Check outlet tube (should be clean and undamaged).
5. Check filter element for holes and tears (replace if damaged).
6. If filter is undamaged, it may be cleaned by using compressed air (always blow air in opposite direction of normal air cleaner flow).
7. Wipe out any dirt in the filter housing.
8. Install filter element.
9. Replace end cover and secure.

NOTE: **Always handle filter element carefully to prevent dirt from shaking loose onto clean side of system.**

UNIT 4.3 CHECKLIST NUMBER 6

CHANGING HEAD LAMP

- A supply of smaller lights as well as sealed beam head lamps, fuses and wire should be carried with the vehicle.

Steps

1. Park vehicle, shut off and secure.
2. Remove trim ring from burned out light.
3. Unfasten mounting screws.
4. Disconnect light from socket and remove.
5. Remove any dirt or bugs from socket area.
6. Replace with new head lamp (plug it in).
7. Test lamp to see if its working properly.
8. Fasten mounting screws.
9. Replace trim ring.
10. Make sure new light is clean.

NOTE: Do not touch head lamp adjusting screws!

CHANGING FUSES AND RESETTING CIRCUIT BREAKERS

Fuses

- Always use right size and amp. fuse (new fuse should have the same amp. rating as the fuse it replaces).

Steps

1. Check the fuse and clip holder for cleanliness and burns.
2. If dirty, touch up the contact points with a coarse cloth.
3. Gently but firmly snap new fuse into clip holder (make sure there is a good connection between fuse ends and clip holder).

Circuit Breakers

1. Remove circuit breaker cover panel.
2. Flip the circuit breaker switch back in the opposite direction to reset.
3. Replace panel.

UNIT 4.3 CHECKLIST NUMBER 7

DRAINING MOISTURE FROM AIR RESERVOIRS

1. Place vehicle on level ground.
2. Chock wheels.
3. Set up receptacle to collect contents drained from air reservoir.
4. Open drain cocks by twisting valve on bottom of tank.
5. Allow all air pressure to escape (0 PSI) -- this will permit moisture to drain.
6. Close valve.

DRAINING MOISTURE FROM FUEL SYSTEM

1. Locate filter with water separator.
2. Remove drain plug at bottom of filter.
3. Allow water to drain.
4. Replace drain plug.

UNIT 4.3 CHECKLIST NUMBER 8 (PG 1 OF 2)

ADJUSTING BRAKES: Drum Brakes (S-Cam)

Preparation

1. Chuck wheels.
2. Clean adjusting area.
3. Press down on lock collar.
4. Turn adjusting screw until shoes make contact with the drum.
5. Visually check to see that contact was made.

The adjusting screw is being turned the wrong way if:

- A The screw turns more than two full turns.
- B. The push rod starts to pull out of the chamber.

Adjustment

1. Back screw off 1/2 turn.
2. Measure push rod travel.
 - a. **With air pressure**
 - Have someone apply pressure (100 PSI).
 - Push rod should travel between 1 and 1-1/2 inches.
 - b. **With a pry bar**
 - If alone pull out push rod with a pry bar
 - Pushrod should travel between 1/2 and 3/4 inches.

NOTE:

This is a simplified illustration of brake adjustment procedures. Remember, brake adjustments should be performed only by a trained driver (FMCSR SEC. 396.25), following maintenance manual procedures and then only to enable the driver to move vehicle to a point where service by a qualified mechanic is available.

UNIT 4.3 CHECKLIST NUMBER 8 (PG 2 OF 2)

ADJUSTING BRAKES: Disc Brakes (Power Screw)

Preparation

1. Chuck wheels.
2. Clean adjusting area.
3. Turn adjusting nut until brake linings contact disk,
4. Check visually to see that contact was made.

Adjustment

1. After linings contact disk, back screw off one complete turn.
2. Road test (this type adjustment will provide a slightly increased stroke and will necessitate more frequent adjustments).

NOTE:

This is a simplified illustration of brake adjustment procedures. Remember, brake adjustments should be performed only by a trained driver (FMCSR SEC. 396.25), following maintenance manual procedures and then only to enable the driver to move vehicle to a point where service by a qualified mechanic is available.

UNIT 4.3 CHECKLIST NUMBER 9 (PG 1 OF 3)

CHECKING TIRE AIR PRESSURE

1. Remove valve stem cap.
2. Place air gauge over valve stem opening.
3. Read inflation pressure (inflate if necessary)
4. Replace cap.
5. Check operators manual or read correct inflation pressure for tire on its side wall.
6. Replace cap.

NOTE: check air pressure when tires are hot. **Hot tire readings are incorrect.**

CHANGING A WHEEL / TIRE ASSEMBLY

A. Secure Vehicle

1. Park vehicle on level ground.
2. Chock other wheels fully against vehicle movement.
3. Set parking brakes and place transmission in lowest forward gear.

B. Inspect Tire

1. Check for over inflation.
2. Compare appearance of tire with that of other tires.
3. Check side and lock rings.
4. On duals, also check seating of inner tire.
5. If inflation or seating does not appear normal, avoid attempting tire change, obtain expert help.

C. Place Jack

1. Refer to owners manual to determine proper placement of jack for removing the tire to be changed.
2. Place hardwood plank or block under base of jack regardless of surface.

UNIT 4.3 CHECKLIST NUMBER 9 (PG 2 OF 3)

D. Remove Wheel/Tire Assembly

1. Loosen stud nuts.
2. Observe direction of rotation.
 - a. Examine thread
 - On some wheels, direction indicated on end of stud
 - "R" means to right (clockwise)
 - "L" means to left (counter-clockwise)
3. Stand to one side of tire. Portions of wheel assembly may fly outward and cause injury when stud bolts are loosened.
4. Turn stud nuts by hand until they are flush with the end of the stud.
5. Loosen clamp (on cast-type wheels).
6. Tap with hammer
 - a. Don't remove stud nuts until clamp is free.
 - b. Clamp could fly off studs.
7. Remove air lines from any wheels with a tire pressure sensing device, and cap the line and actuator.
8. Raise vehicle
 - a. Jack up vehicle to allow tire to clear the surface
 - b. Stand clear of vehicle while raising jack.
 - c. Vehicle could slip off jack and cause severe injury if arms, legs, or head are under the vehicle.
9. Remove the wheel assembly.
 - a. Remove stud nuts.
 - b. Pull off wheel assembly.
10. Remove inside wheel of a dual wheel assembly following the same procedure.

E. Replace Wheels

1. Replace inside duals first.
2. Mount wheel
 - a. Place wheel on hub
 - b. Install rim clamp (cast-type wheel)
 - c. Install stud nuts
 - d. Tighten nuts properly

UNIT 4.3 CHECKLIST NUMBER 9 (PG 3 OF 3)

3. Follow prescribed pattern.
 - Consult owners manual for proper pattern. If manual not available, use the following tightening sequence:
4. If wheel is free to rotate, move the nut to be tightened to the top position.
5. Use proper tightening procedure.
 - a. Tighten with lug wrench.
6. Use torque wrench for final tightening.
 - a. Follow torque specifications in owners manual.
 - b. Don't over tighten.
 - Can damage rim.
 - Can strip treads on stud.
 - c. Don't under tighten.
 - d. Nuts can work loose.
 - e. Wheel could come off.

NOTE: Never use oil or grease on studs.

7. If tires equipped with pressure sensing device.
 - a. Remove caps.
 - b. Connect air line to actuator
8. Lower vehicle.
 - a. Lower jack until tire supports the weight of the vehicle.
 - b. Remove the jack.
9. Store equipment in proper place.
 - a. Jack and support plank.
 - b. Store damaged tire (where spare came from).
 - c. Remove wheel chock.

F. RECHECK TORQUE

1. Stop after driving a few miles and tighten nuts as necessary using torque wrench.
 - a. Rotation of wheel almost always loosens wheel.
 - b. Nuts can fall off unless tightened.
2. Repeat process after 100 miles.

UNIT 4.3 CHECKLIST NUMBER 10

PROCEDURES FOR JUMP STARTING DEAD BATTERIES

Observe Safety Precautions

1. Shield eyes or wear safety goggles.
2. Don't smoke.
3. Make sure batteries are negatively grounded and carry same voltage (e.g., 12 volt charging 12 volt).
4. Do not get battery acid on skin or clothing.
5. Never jump start if battery fluid is frozen.

Prepare Vehicle

1. Align vehicles (do not let vehicles touch each other).
2. Set parking brakes.
3. Place transmission in neutral.
4. Add water to battery if needed.

Hook-Up Jumper Cables (Steps must be taken in order)

1. Clamp jumper cable to positive pole of dead battery.
2. Clamp other end of the same cable to positive pole of booster battery.
3. Connect second cable to negative pole of booster battery. Be careful that the two cables don't touch.
4. Attach other end of second cable to truck frame or block of disabled vehicle, as far away from battery as possible.
5. Start engine of booster truck, wait a few minutes to allow current from booster battery to flow to dead battery.
6. Crank engine of disabled vehicle with clutch disengaged to reduce load on cranking motor.
7. When disabled vehicle is started, immediately remove jumper cables carefully in reverse order of how they were put on.

NOTE: Care must be taken to identify negative ground system before attempting to use these procedures. If this is not done, serious damage to a vehicles alternator could result.

UNIT 4.3 CHECKLIST NUMBER 10

PROCEDURES FOR JUMP STARTING VEHICLE WITH AIR STARTER **(UNIT HAS LOST AIR PRESSURE)**

Prepare Vehicle

1. Align vehicle with a charged air supply.

Hook-U!

A. Using a Compressor

1. Hook up an air line from compressor to the glad hand of the disabled vehicles air reservoir.
2. Fill reservoir.
3. Start disabled tractor

B. Using Another Tractor

1. Hook up an air line from one reservoir to the other.
2. Start the booster tractor.
3. Fill empty air reservoir on disabled vehicle.
4. Start disabled tractor.

SECTION 5 - Non-Driving Activities

The units in this section cover activities not directly related to the vehicle itself but which must be performed by the twin trailer driver. The objectives of the units in this section are to insure that these activities are performed in a way that assures safety to the driver, the vehicle, cargo, and other road users. Unit 5.3 provides instruction on the importance of professionalism, maintaining a good image, being in the public's eye, and how good safety principles help to maintaining good public and employer relations.

Three units comprise this section:

UNIT: SUGGESTED CLOCK HOURS OF INSTRUCTION

UNIT		CLASS-ROOM	LAB	RANGE	STREET	TOTAL
5.1	Routes And Trip Planning	4.5				4.5
5.2	Cargo And Weight Considerations	4.5	2			6.5
5.3	Public Relations And Safety	2				2
TOTAL		11	2	0	0	13

5.1 ROUTES AND TRIP PLANNING

Purpose

This unit provides classroom instruction on the importance of and requirements for planning routes and trips. This is to include classroom discussion on federal and state requirements for permits, vehicle size and weight limitations, designated highways, local access, the reasonable access rule, staging areas, access zones, etc.

Outline of Suggested Content

CI Trip planning principles

- A. Definition.
- B. Type of trip.
- C. Estimating.
 - 1. Time requirements of trip.
 - 2. Fuel usage and purchase.
 - 3. Amount of money needed.
- D. Driver related factors.
- E. Vehicle related factors.
- F. Cargo related factors.
- G. Weather related factors.
- H. Map reading.
 - 1. Types of maps and road atlases.
 - 2. Map symbols and legends.
 - 3. Highway mileage charts.
 - 4. Using a map or road atlas.

☐ Route planning principles

- A Federal highway system.
 - 1. Federal Motor Carrier Safety Regulations.
 - 2. Permits and authorities.
 - 3. Definition of STAA vehicles.
 - 4. Size and weight limitations.

5. Reasonable Access rule.

B. State and local public roads.

1. State and local public regulations.
2. Permits and authorities.
3. State reciprocity agreements.
4. Ports of entry.
5. Portable and fixed scale houses
6. Size and weight limitations.
7. Truck specific speed limitations.
8. Local access.
 - a. Staging areas.
 - b. Access Zones.
 - c. Designated access highways.

• **I Hazardous materials**

- A. Federal regulations.
- B. State and local restrictions.

☐ **Record keeping and trip records**

- A. Reports driver must maintain.
- B. Freight documentation and related reports.
- C. Trip records and related expense reports.
- D. Tachograph, trip recorders and other monitoring devices.

• **I Communications**

- A. Telephone.
- B. Satellite.
- C. Publications.
- D. Newsletters.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Plan a route from one point to another that optimizes travel time, fuel cost, potential hazards, and federal, state and local travel restrictions.
- Arrange to secure permits required by nature of the vehicle, its cargo, and routes of travel.
- Arrange for a secure place for the vehicle on layovers, especially when transporting hazardous material.

KNOWLEDGE OBJECTIVES

Driver must know:

- The types of vehicles, cargoes and routes requiring special permits.
- State requirements and the procedures for obtaining permits.
- State requirements and the procedures for ports of entry.
- Map or road atlas symbols, legends and mileage charts.
- How to use the Federal Motor Carrier Safety Regulations Handbook to ascertain regulations applicable to trip.
- The driver's responsibilities when hauling hazardous materials.
- The procedures for route planning. This is to include preparing paperwork, route selection and estimating time, fuel, money and personal needs to complete the trip successfully.
- State and local restrictions on vehicle size and weight.

SKILL OBJECTIVES

THE DRIVER MUST:

- Read and interpret maps or road atlases.
- Estimate travel time, and plan meal stops, rest stops and layovers.
- Estimate mileage, fuel consumption and plan fuel stops.
- Estimate expenses and arrange for sufficient funds or method of payment.

ATTITUDE OBJECTIVES

The driver must believe:

- o Federal Motor Carrier Safety regulations are for the good of everyone.
- o State and local restrictions on size and weight are important safety issues
- o Hazardous material regulations protect the common good.
- o Effective route planning is essential.
- o Failure to obtain necessary permits, stickers, etc. can result in extensive delays and/or fines.

Major supporting concepts

- o Drivers who operate twins need to be informed about the designated routes off the interstate system. Most companies give drivers specific routes to follow for each dispatch.
- o Among the routes or roads that twin drivers may need to be concerned about are: specific trip routes; optional trip routes; authorized routes; state selected access roads; routes between designated route systems; detours; and unusable or impaired routes.
- o There are routes that cannot be used because they contain bridges that fail to meet the state's load capacity criteria. There are also routes that may be impaired, that is, may be unsafe or degrade traffic operations.
- o Local access: Three approaches are currently (1985) used to provide access for LCVs to and from designated highways:
 - o Staging areas: Turnpikes which allow longer combinations generally have staging areas on or adjacent to the right-of-way so that trucks can be broken into shorter combinations. The truck operator either stations a second tractor nearby to transport the extra trailer beyond the designated route, or the extra trailer is left at the staging area until the original tractor can return for it.
 - o Access zones: When the nationwide network for the shorter Western Doubles or twins was mandated by the STAA of 1982, the states were required to provide for "reasonable access". Most states responded by allowing twins to travel within a specified distance of the network, subject to various restrictions. Local access ranged from less than a mile to practically the entire state.
 - o Designated access highways: Some states allow carriers to use specific highway segments that can accommodate particular vehicles.

- 0 Reasonable Access: The FHWA issued a final rule on June 1, 1990 that amends “reasonable access for commercial motor vehicles with lengths and widths authorized by the surface Transportation Assistance Act of 1982”. The access rule:
- Defines “terminal” as a location where freight originates, terminates or is handled in the transportation process or where carriers have operating facilities;
 - Prohibits states from restricting access within one mile from the national highway network, except for specific safety reasons on individual routes;
 - States that states that allow specific vehicles access on an individual route must provide access on that route to all vehicles of the same type. Distinction between vehicle types must only be based on significant differences in their operating characteristics;
 - Prohibits blanket restrictions on 102 inch wide vehicles;
 - Vehicle dimension limits shall not be more restrictive than federal requirements;
 - All states must have an access review process, except those with laws authorizing the operation of STAA dimensioned vehicles on all public roads and highways.;
 - States without FHWA approved access provisions in effect by June 1, 1991, must follow the requirements stated in the final rule.

MATERIALS

Classroom instruction must be supported by transparencies or individual class handouts including maps for route planning, copies of the Federal Motor Carrier Safety Regulations & Hazardous Materials Safety Regulations, illustrative samples of permits, copies of various state size and weight regulations and port of entry requirements.

5.2 CARGO AND WEIGHT CONSIDERATION

Purpose

This unit provides classroom instruction on the importance of proper cargo documentation, loading, securing and unloading cargo, weight distribution, load sequencing and trailer placement. Emphasis is placed on the importance of axle weight distribution and trailer placement of twins and its effect on vehicle handling.

Outline of Suggested Content

☐ **Cargo documentation**

A. Definition, responsibilities and forms.

1. Bills of Lading.
2. Freight bill or pro.
3. Cargo manifest.
4. Interline freight.
5. Other documentation.

B. Pickup and delivery procedures.

1. Driver's responsibilities.
2. Loading and unloading.
3. Special services and / or procedures.

C. Hazardous materials.

1. Documentation and placarding.
2. Driver's responsibilities.
 - a. At time of pickup.
 - b. In transit.
 - c. At time of delivery.
3. Special situations.

☐ **Loading, Securing and Unloading**

- A. Federal Motor Carrier Safety regulations.
 - 1. Overview.
 - 2. Driver's responsibilities.
- B. Loading and blocking techniques.
- C. Consequences of improperly securing cargo.
- D. Sealed or containerized loads.
- E. Specialized cargo.

☐ **Weight Distribution and Center of Gravity**

- A Importance of uniform weight distribution.
 - 1. Loading, blocking and weight techniques.
 - 2. Unloading techniques and weight redistribution.
 - 3. Consequences of poor weight distribution.
- B. Overweight definitions.
- C. Definition of center of gravity.
- D. Effect of high / low center of gravity on:
 - 1. Handling characteristics.
 - 2. Trailer stability.
 - 3. Turning or cornering ability.
 - 4. Rearward amplification.
 - 5. Rollover.

☐ **Load Sequencing and Trailer Placement**

- A. Importance of uniform weight distribution among axles.
- B. State Regulations.
 - 1. Usually heavier trailer first if both trailers are of equal length.
 - 2. Weight differential for trailer placement varies by state.
 - 3. Considerations for width and height.
- C. Discussion on brake induced instability.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE I V E S

Driver must be able to:

- 0 Verify nature, amount, and condition of cargo at time of pickup and / or delivery.
- 0 Verify information on bill of lading and properly issue bill of lading to shipper.
- 0 Load and unload cargo safely and efficiently.
- 0 Ensure that the weight and distribution of the load meet legal and safety requirements.
- 0 Secure, block and l or brace load properly.
- 0 Ensure proper load sequencing and trailer placement to meet legal and safety requirements.
- 0 Properly complete all required paperwork, complying with all Federal Motor Carrier requirements dealing with cargo handling, documentation, record keeping and placarding .

KNOWLEDGE OBJECTIVES

Driver must know:

- o The procedures for properly completing all required paperwork.
- 0 The procedures for complying with all Federal Motor Carrier, cargo handling, documentation, record keeping and placarding requirements*
- o The drivers responsibilities when hauling hazardous materials.
- o The procedures for loading and unloading.
- 0 The procedures for securing cargo, including methods of blocking, bracing, packing, stacking, and the use of straps, rope, cable, chains, and chain binders.
- 0 The nature, function, and operation of common cargo handling equipment, including pallets, jacks, dollies, handtrucks, forklift trucks, nets, slings, rug poles, and other equipment.
- o Federal and state regulations on loading, weight limits, weight distribution, load sequencing and trailer placement.
- 0 Factors affecting brake induced instability.

SKILL OBJECTIVES

THE DRIVER MUST:

- 0 Be able to perform basic mathematical calculations to conduct accurate cargo count.

ATTITUDE OBJECTIVES

The driver must believe:

- The proper completion of cargo documentation is important to the prevention of theft, claims and compliance with the law.
- That the proper handling and securing of cargo is necessary for the protection of the cargo, the vehicle, the driver and other road users.
- Federal, state and local restrictions on size, weight and trailer placement are important safety issues.
- 0 Hazardous material documentation must be properly completed for public health, safety and for compliance with the law.
- That penalties for noncompliance with hazardous material regulations can be very severe for both the driver and his employer.

Major supporting concepts

- 0 Twins typically weigh more than tractor-semitrailers. They can carry higher average payloads. They weigh more when empty, but they typically have the same number of axles as tractor-semitrailers.
- 0 The loads on twins are usually distributed less uniformly among their five axles than loads on five-axle tractor-semitrailers.
- 0 When a vehicle undergoes a turn, it experiences a centrifugal force pulling outward from the center of the turn through the vehicle's center of gravity. This force tends to roll the vehicle outward from the turn, and if large enough, will cause the vehicle's inside tires to lift from the ground and roll the vehicle over.
- 0 In articulated vehicles, rollover in the **rearmost** trailer is promoted by high centers of gravity, narrow wheel tracks, and inadequate roadway superelevation -- in addition to excessive speeds and sharp turns.
- 0 Rearward amplification can cause an exaggerated motion of the last trailer (of a twin combination), and could cause a rollover of the last trailer if the last trailer has a high center of gravity.
- 0 For safe handling on the road, the more heavily loaded twin trailer should be in the first position.

- The weight differential at which one trailer becomes "lighter" than another varies among states. Some states have determined the thresholds of "significant" weight difference to be from 1,500 to 5,000 pounds, while some states (FL, NV, UT) simply require that the heavier of the two trailers shall be the lead trailer.
- The reason for requiring trailer sequencing stems from brake-induced instability. A lightly loaded trailer when used in combination with a more heavily loaded one, is likely to experience wheel lockup under heavy braking before the more heavily loaded trailer. If the light load is in the first trailer, this could lead to a tractor jackknife or buckling of the entire combination unit vehicle in its middle (first trailer) section. If the light load is at the rear of the combination and locks up, it may experience trailer swing, which is more amenable to recovery than jackknifing.
- Controverting factors include loading and l or unloading practices that produce either an empty rear trailer or one that is more heavily loaded than the leading trailer.

MATERIALS

Classroom instruction must be supported by transparencies, wall charts, printed materials or individual class handouts to present information on cargo documentation, cargo handling , loading & unloading procedures and principles of weight distribution.

5.3 PUBLIC RELATIONS AND SAFETY

Purpose

This unit provides classroom instruction on the importance of professionalism , maintaining a good image, being in the public's eye, and how good safety principles help to maintaining good public and employer relations.

Outline of Suggested Content

CI The image of the trucking industry

- A. From the government sector.
- B. From the public's perspective.
- C. From the trucking company perspective.
- D. From the driver's perspective.

☐ Contact with the public

- A. Safe driving principles and good image.
 - 1. Following the law.
 - 2. Following Safe Operating Practices
 - 3. Sharing the road.
 - 4. Being courteous and helpful.
- B. Good appearance and attitude.
 - 1. Both on & off duty.
 - 2. Show respect, courtesy and understanding.
 - 3. Rendering assistance.
 - 4. Standing up for the industry with dignity and understanding.
 - 5. Be proud to be a professional driver.

☐ Customer relations

- A A driver is his company's visible contact with the customer.
- B. Drivers can sell themselves and their company.
- C. Follow the rules, both your company's and the customer%.
- D. Have a positive attitude, it will get you where you want to go.

❑ Employerrelations

- A. Know your basic job requirements.
- B. Comply with the Federal Motor Carrier Safety Regulations requirements.
- C. Follow company policies and procedures.
- D. Always display a professional attitude.

• 1 Safety concerns

- A. Special hazards to twins on the road.
 - 1. Steep grades.
 - 2. Sharp curves.
 - 3. Narrow lanes & shoulders, etc.
- B. Handling characteristics.
 - 1. Rearward amplification.
 - 2. High speed off-tracking.
 - 3. Impaired sensory feedback to the driver.
- C. How to compensate.
 - 1. Increase knowledge through training.
 - 2. increase driving skill through training.
 - 3. Incorporate Safe Operating Practices into driving habits.
 - 4. Always display a professional attitude while driving.

INSTRUCTIONAL OBJECTIVES

PERFORMANCE OBJECTIVES

Driver must be able to:

- Maintain a neat personal appearance on and off duty.
- interact tactfully with customers and the general public.
- Lend assistance to other motorists when permitted.
- Be courteous to other drivers by following the principles of sharing the road.
- Incorporate Safe Operating Practice driving principles into driving habits.
- Always display a professional attitude, even in the face of adversity.
- Compensate for the special handling characteristics and unique road hazards peculiar to twins.

KNOWLEDGE OBJECTIVES

Driver must know:

- The impact the driver has on the image of his company and the trucking industry.
- How to show respect, courtesy and understanding.
- The direct and indirect effects of unsafe and discourteous acts upon the public's image of his employer and the trucking industry.
- The rules of the company and the customer.
- The proper procedures for handling complaints from the general public or customers.
- The particular handling characteristics of twins and know how to compensate for them.

ATTITUDE OBJECTIVES

The driver must believe:

- That the perception of how others see professional drivers handling themselves and their vehicles is very important.
- That obeying traffic laws will not only reduce the risks of having an accident but will enhance the image of the professional driver.
- That company and customer rules and regulations are important and should be followed.

- That courtesy on the highway is important, improves the image of the company and the industry and is a good safety principle to follow.
- Professional drivers must compensate for the lack of understanding of others with whom we share the road.
- That it is his responsibility to enhance the image of the professional driver on the road and elsewhere.
- That a professional driver is always in control of his vehicle and his emotions.
- Improper use of the horn, signals, and the cb is potentially dangerous and will tarnish the image of the professional driver.
- That a professional driver has a moral obligation to himself and the motoring public to be the best he / she can be.

Major supporting concepts

- Professionalism is expressed as an attitude that marks the difference between the true professional driver and a would be pretender.
- Professionalism is the practice of safe, courteous and responsible behavior, at all times, on and off the highway.
- Every driver, professional or not, is an ambassador carrying a message to the public about truck safety and driving professionalism.
- Ultimately, the attitude and behavior of driving professionals will determine the public's perception of truck safety and truck drivers.
- Motor carriers and drivers ultimately must be the ones who decide that professional driving behavior is the only acceptable way to operate heavy trucks. This can be accomplished, on the part of motor carriers, by continuous efforts to qualify, hire, and train only the best, most professional people to operate their trucks, this coupled with consistent driver supervision and reasonable trip scheduling. For drivers, it involves adherence to the principles of professionalism, good judgment, common sense and courtesy.
- Twins can create special hazards on highways not designed to handle them -- roads with steep grades, sharp curves, and narrow lanes and shoulders.
- The growth in the use of twins has not increased highway accident losses, but twins do have certain handling characteristics that pose a risk in some circumstances. The characteristics may be summarized as:
 - Rearward amplification.
 - High speed off-tracking.
 - Impaired sensory feedback to the driver.

- The accident risk driving twins is slightly greater unless the driver is well aware of the particular handling characteristics of twins and is skilled at allowing for these characteristics.
- Public awareness of truck safety and media attention to the topic are intense. Many people perceive current truck safety problems as the consequence of trends toward more and larger trucks.
- The actions of the vehicle driver probably have a greater influence on an accident occurrence than any other factor.
- State regulations may require that twins have on board certain types of emergency equipment or spare parts such as triangles reflectors, fire extinguishers, light bulbs or spare fuses.

MATERIALS

Classroom instruction must be supported by transparencies, wall charts, printed materials or individual class handouts to present information on driver professionalism, the image of the trucking industry, public and employer relations, interpersonal skills, safety concerns and how to compensate.

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